THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. JUNE 10, 1897. CHICAGO, ILL. NUMBER 23.

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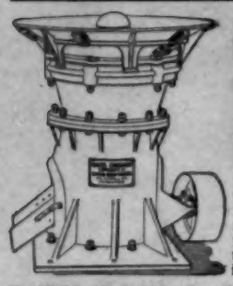

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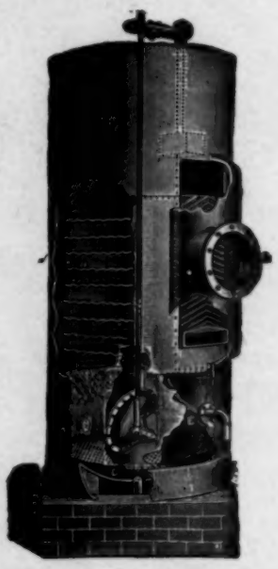

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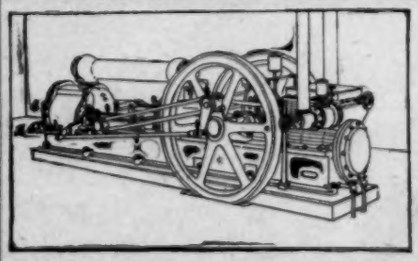

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. JUNE 10, 1897. CHICAGO, ILL. NUMBER 23

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The buying in iron and steel, in the past week, has given evidence that a widening circle of consumers believe that the worst is over and that lower values need not be expected. The fact has been recognized that if prices could be crowded further down, the number of producers, to whom idleness would then be less expensive than operation would be so large that the upward turn must quickly follow, through curtailed production. Just now there is a double buying movement in certain finished lines—the placing of contracts covering a year, by buyers who appreciate the advantage of to-day's low prices on such long deliveries, and at the same time a good aggregate of small orders in anticipation of the shut-downs from wage differences, that will come at the end of the month. In bar iron, sheet and tin plate lines, the interruption is likely to be prolonged, the manufacturers insisting that unprecedentedly low prices will not stand schedules that have accompanied higher markets, while the workers show no little enthusiasm in contending that practical promises must be made good, without regard to market conditions. The largest item in current buying is for agricultural implement work, Pittsburg and Chicago reporting large contracts closed and pending. The promise of structural business is still fair, and low prices bring out a good aggregate of well-scattered small orders. Pipe mills have booked some good business for home delivery and an export deal of some proportions is pending. Bessemer pig iron holds the advance noted a week ago, in the Pittsburg district, but much of the metal sold is on trades for billets and sheet and tin plate bars. Sales at $9.75 delivered at Pittsburg steel works are reported for the third quarter of the year. Valley iron has sold at $9.25 for prompt shipment and at $9.50 for valley delivery in the next four or five months. A Pittsburg furnace has sold a 3,000-ton lot, June shipment, at $9.25 at furnace, equivalent to $9.50 delivered at buyer's works. Billets maintain the advance of 25 to 50 cents, and Pittsburg mills are generally firm at $14.25, July and August, with $14.35 quoted by some. The free buying of foundry irons by large Western interests a fortnight ago has brought a considerable train of lesser orders. Certain Southern furnaces are reported less elastic on prices, though no advances have been maintained. The wire rod deal is off for the present, at least, the responsibility for the hitch being divided between two Western interests. Opinion is divided as to the probability of a successful issue for the scheme when it is brought up again. The pendency of a tariff bill was not an opportune time to agitate syndicate control and higher prices; but with rods at foreign mills $5 to $6 higher than the price at Atlantic port, the bearing of the tariff on the question is not so immediate as some of the anti-protection orators in the Senate seem to think.

THE CLEVELAND DISTRICT.

Ore-buying has been going on in a steady way for the past ten days, a number of lots of 25,000 and 50,000 tons being reported, in addition to the 300,000 tons for the Wheeling district referred to last week. The buying is distributed among Western Pennsylvania and Ohio furnace interests, and takes in old-range Bessemer ores, with a considerable percentage, also, of non-Bessemers. Of the former, the Vermilion and Gogebic ranges have furnished the greater part, in recent sales. The prices of non-Bessemer ores have been lower than was talked of earlier in the season, and some deals have been made, with the operation of the mines as the chief object, the price giving no profit. One lot of Mesabi ore, 59 per cent in iron and .07 in phosphorus, taken out just next to the stripping, has been offered at $1.75. It is probable that further shut-downs, particularly of non-Bessemer properties, will be made, through the summer months, this time being chosen because it involves less hardship to the men. Lake freights have remained unchanged. Some recent charters are at 55 cents from the head of the lake to Sept. 1 and 60 cents to Oct. 1. Practically all the lake fleet is now in commission.

Pig Iron Negotiations involving about 50,000 tons of Bessemer iron have been on in the valley the past week. One transaction involving 30,000 tons, delivery through the year, at $9.40 at valley furnace, was upset by the furnace when on the point of being closed. In another transaction a block of Bessemer was taken at $9.50 delivered in the valley, in the third quarter. Still another deal for iron for delivery at valley works involved a trade in tinplate bars. The feeling is firm and the amount of inquiry of late has encouraged preparations for resumption by two valley furnaces—one Hubbard stack and the Raney & Berger Furnace. Half the product of the latter will be taken by Naylor & Co., who have considerable Bessemer iron sold. The foundry trade is better, and there is more of a tendency to order forward iron on contracts. From Northern Ohio foundries more frequent inquiries are now being received, a number desiring to cover at current prices for the balance of the year. Southern irons are still quoted on a basis of $6.50, Birmingham, for No. 2, with a $3.30 freight to Cleveland. We quote, Cleveland delivery:

Bessemer	$9 75@ 9 90	Valley Scotch No. 1	$10 65
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 15
No. 2 Strong Foundry	9 90@10 15	Gray Forge	8 75@ 8 90
No. 3 Foundry	9 25@ 9 50	Lake Superior Charcoal	13 25

Finished Material. While the aggregate of inquiry and orders is larger, the lowest price quoted recently on any form of finished material is still obtainable. In plates the competition between the Pittsburg and Chicago districts in middle ground is very sharp. A 50-ton order of 3-16 and ¼-inch plates the past week was taken at a shade under 1.05c, delivered in Cleveland from Chicago. Some agricultural buying is reported, with more in prospect, one letting of 1,000 tons coming next week. Some requirements for ingots, billets and tin plate bars are under inquiry locally. The wire rod market is quoted $20.50, with prospects of more activity, now that the syndicate plan for control is out of the way. A sale of 400 tons of rods for shipment to Japan to the wire and nail plant furnished from Cleveland some months ago, is reported. In beams and channels there is continued small-lot inquiry. The steel for the Chamber of Commerce will come from Pittsburg, and the erecting work will be done in Cleveland. Quotations are unchanged at 1.08½c Cleveland.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, June 9

Business generally has been better in the past week than it was the week before. Orders are larger, and inquiries are more frequent and for larger lots. Some branches of the business show more improvement than others, but the foregoing is true as a general thing. The largest business closed and in sight is from agricultural implement manufacturers, who have come into the market for very large lots of material in the last three weeks, and are apparently buying fully as much as they have in previous years. The bulk of the pig iron buying by this class of trade has already been taken, but there are still several contracts in the market which will probably be closed within the next week or two. The steel market, billets, rods, etc., is quiet, and nothing has transpired regarding the proposed control of wire rod production. It is the belief of the trade here that nothing further will be heard of the arrangement for the present at least. Business in structural material is coming in quite freely, although most of it is in small lots. No large contracts have been closed in the past week.

PIG IRON.—The market is in better shape than it was a week ago, both sales and inquiries having improved to a considerable extent. Most of the business taken last week was closed by local furnaces, orders for Northern iron running into a large tonnage and exceeding the sales of the week before quite a good deal. The Northern furnaces are inclined to be firm in their views, and are making reductions from the ruling prices only in exceptional cases. Southern furnaces are also reported to be firmer, although quotations have not been advanced. Some of the furnaces are not making as low prices as were ruling a week or two ago, but are more inclined to let business pass rather than cut quotations. The tonnage taken by the Southern furnaces last week was not large, nor do they report any very large inquiry in hand. Further rumors are heard of reductions in Southern freight rates, but nothing definite could be learned. Quotations are made about as follows:

Lake Sup. Charcoal	$13 00@13 25	Southern No. 1 Soft	$ 9 75@10 25
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 2 Soft	9 75@10 00
Local Coke Fdy. No. 2	10 25@10 50	South'n Silveries	10 25@10 50
Local Coke Fdy. No. 3	10 00@10 25	Jackson Co. Silveries	13 00@15 00
Local Scotch Fdy. No. 1	10 50@10 75	Ohio Silveries	13 00@15 00
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 25@10 50	Malleable Bessemer	10 75@11 00
South'n Coke No. 2	9 75@10 00	Coke Bessemer	11 50@12 00
South'n Coke No. 3	9 50@ 9 75		

BARS.—A very large inquiry is being had for bar iron and steel, most of it from the implement manufacturers. These are asking bids on a total of over 30,000 tons of bars, in lots ranging from 16,000 tons down. So far only a few, comparatively, of these contracts have been placed, but most of them will be closed up within the next two or three weeks. The mills do not appear to be anxious to accept the long time contracts at the low figures that have been ruling for the past few weeks, and some of them are asking quite an advance on contracts calling for deliveries for the next ten months. The range of quotations is very wide, some of the mills making prices of less than 1c on both iron and steel, while others are asking 1.10c and higher.

RAILS AND TRACK SUPPLIES.—The market is quiet, with only a small business in heavy sections and a fair demand for light sections. The latter are selling quite freely in small lots. Quotations are made: Rails, $21 to $23, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—No large sales were made last week and the total tonnage closed, in both billets and rods, was only small. Quotations are unchanged at $16 for billets and $22 for rods.

STRUCTURAL MATERIAL.—The demand for small lots of material for both bridge and building work is increasing all the time, and sales last week were very fair. No very large lots were in demand last week, and none are expected to be closed up in the immediate future. Quotations are as follows: Beams and channels, 1.15c to 1.20c; angles, 1.10c to 1.15c; plates, 1.10c to 1.15c; tees, 1.30c to 1.40c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—Orders continue to be fair, although by far the larger part of them are for small lots. No large inquiries have been received. Quotations are made as follows: Tank steel, 1.10c to 1.20c; flange steel, 1.25c to 1.35c; fire-box steel, 1.85c to 5c.

SHEETS.—Most of the business coming up is confined to small lots, but one or two large contracts were closed last week. The demand is a little better than it was a week ago. Prices are not strong, and are made at 1.90c to 2c for No. 27 black, and 80 and 5 to 80 and 10 per cent off for galvanized.

MERCHANT STEEL.—Several good contracts were closed up last week and others are in prospect. The larger part of the tonnage is in small orders, but the aggregate is very satisfactory. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—Almost no business is being done except between dealers. Consumers are not in the market for any large lots of any kind of scrap. Prices are nominally $10.75 and $11.25 for old iron rails, $6.50 to $7 for old steel rails, and $10.25 to $10.75 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $10.50 to $11; dealer's forge, $8.25 to $8.50; No. 1 mill, $5.75 to $6; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $14.25; cast borings, $3; wrought turnings, $4; axle turnings, $5.50 to $6; mixed steel, heavy, $6.25; stove plates, $6; heavy melting steel, $7.50 to $8.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, June 9.

The finished material side of the market is adding weekly to the branches showing a better business. Wrought pipe and steel bars have developed a more active condition during the week and sheets and structural material show no relapse. Old material is also in line, even though the advance is moderate. Bessemer has moved freely and is still strong. Little inconvenience was caused by the strike at Jones & Laughlins and specifications are again being met. The negotiations for rod mill product are off for the present at least. Rods showed a firmer tone for a week or more but are again offered at old figures.

PIG IRON.—Bessemer pig iron continues a strong feature but scarcely strong enough to justify the rumored blowing in of valley furnaces. The Hubbard furnaces have disposed of considerable iron of late and, it is announced, will blow in in the next few days. Other Mahoning and Shenango Valley interests are waiting for a favorable turn and may resume soon. Naylor & Co. have leased the Raney & Berger furnace at New Castle, which will blow in at once on Bessemer. Buying during the week has been heavy but includes much of the trading sort for which the Pittsburg market has of late been conspicuous. Upwards of 30,000 tons have changed hands in lots of 12,000, 10,000, 5,000 and smaller amounts. While the prices are in the main meaningless because based on exchanges, they are said to be in the vicinity of $9.50, Pittsburg, for early shipment, with higher prices for third quarter delivery. A valley sale of 5,000 tons is reported at $9.25, and 3,000 tons of Pittsburg iron for immediate shipment brought $9.25 at the furnace. A Pittsburg sale of 2,000 tons early in the week, for extended delivery, brought $9.75, delivered. Foundry irons of common grades are still offered cheap and gray forge at $8.75 is not in demand. We quote:

Bessemer	$ 9.50 to $ 9.75
No. 1 Foundry	10.25 to 10.50
No. 2 Foundry	9.50 to 9.75
No. 3 Foundry	9.00 to 9.25
Gray Forge	8.75

BILLETS.—Asking prices on billets continue higher but little business is being covered. Some heavy buyers are feeling the market but are in no haste to buy. Mill quotations range from $14.25 to $14.35, and the feeling is firm.

PIPES AND TUBES.—The sale of about 200 miles of pipe of various sizes within the last fortnight has had a steadying effect on the market. The order for 90 miles of pipe said to be for Sumatra has not yet been finally taken, although a few days will probably settle the matter definitely. This, with 60 miles sold in the week by a Pittsburg mill, for delivery in California, and about 90 miles of line pipe for the Standard Oil Co., divided among three Western Pennsylvania mills, aggregates a better tonnage than has been placed for months. The multitude of small orders is undiminished and a general

expansion of buying is reported. Prices are still weak and little improvement is found in this respect. Quotations are made as follows: Merchant pipe, 57 to 67 per cent; galvanized, 50 to 55 per cent; on carload lots six tens and 5 per cent; less than carload lots, six tens to six tens and 2½ per cent. On merchant boiler tubes prices are made as follows: Two and a quarter inches and smaller, 75 and 10 per cent discount; two and a half inches and over, 80 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

RAILROAD AND TRACK SUPPLIES.—The Duquesne Steel Works are on sheet bars, getting out some specifications on contract, but the rush for rails is not abated, and both Edgar Thomson mills are being pushed to their full capacity. Track material, of course, shares in the rail activity. Quotations follow: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1 45c to 1.55c. Links and pins are quoted at 1.20c to 1.25c.

STRUCTURAL MATERIAL.—Orders ranging in size from 100 tons down are now so numerous as to make a considerable tonnage. The increase for the week is gratifying and the activity shows indications of permanency. Beams, angles and plates are selling at 1c, 1.05c being quoted on small lots. The week ahead will probably develop some larger contracts. One in Philadelphia calls for 2,000 tons of shapes for an office building. Section 1 of the New Orleans drainage work is to be let on the 14th inst., and involves 1,400 tons of beams in addition to other shapes and plates that bring the total up considerably higher. Prices generally are steady. Tees and zees are quoted at 1.15c to 1.20c.

PLATES.—Interest centers in several good-sized contracts to be let during the month. At the New Orleans drainage work letting next week Pittsburg will be represented. Prices are quoted at mill as follows: Tank Bessemer, 1c to 1.05c; open-hearth, 1.05c to 1.10c; shell, 1.20c to 1.25c; flange, 1.25c to 1.30c.

MERCHANT STEEL. — Some few lines of merchant steel, notably tool steel and specialties for agricultural manufacturers, are so active as to take the capacity of mills in these lines. Some season contracts are included. Mill quotations are unimproved, being made as follows: Soft steel bars, 1.20c; spring, 1.20c to 1.25c; open-hearth spring, 1.30c to 1.35c; machine straightened tire, 1.20c to 1.30c; toe calk, 1.30c to 1.40c; machinery steel, 1.30c to 1.35c, base; sleigh shoe, 1.20c to 1.25c. Tool steel, common, 5c to 7c; special brands, 10c up.

IRON AND STEEL SKELP.—Quotations are as follows: Grooved steel skelp, 90c to 92c; sheared steel skelp, 1c to 1.05c; grooved iron skelp, 1c to 1.05c; sheared iron skelp, 1.15c to 1.20c. There is better demand, in view of the activity in pipe.

BARS.—Upwards of 10,000 tons of steel bars are known to have been contracted for during the week. The figure includes yearly estimates of several heavy buyers whose custom is to buy by the year. The business is said to have been taken at from 80c to 90c. Other buyers are in the market, likewise on time contracts. Present demands are not heavy and small lots bring 90c to 95c. Bar iron quotations vary from 85c made in the valley to 1c to 1.05c made in Pittsburg. Little business is current.

SHEETS.—Deliveries for July and August are being carefully limited, out of fear of labor difficulties and higher prices are asked and given. For prompt business some recent prices are not duplicated and more business is being taken at higher figures. On black sheets prices are made as follows: No. 26, 1.80c to 1.85c; No. 27, 1.90c to 1.95c; No. 28, 2c to 2.05c. The committee of the Amalgamated Association meets the tin plate manufacturers' committee in Pittsburg Wednesday, June 9, and an attempt at adjustment will be made. Meanwhile actual tin plate prices as well as quotations on sheets for tinning are higher.

OLD MATERIAL.—Some life has appeared in scrap, resulting in some buying. Old steel rails are the active feature and some heavy Pittsburg users have been buying in quantity at prices said to average $9.25 to $9.50. A sale of short lengths of steel rails is reported at $9.75. Other prices are nominally held as follows: Old steel rails, mixed lengths, $9.35 to $9.50; No. 1 wrought scrap, $9.25; cast scrap, $8.75; hammered iron axles, $14 to $14.50; leaf steel, $11 to $11.25; coil spring, $9.15, gross; old iron rails, $12 to $12.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The slight improvement noted a week ago is maintained, and the increased confidence in better business in the near future is manifested in buyers feeling assured that the lowest plane of values has been reached, and in their willingness to purchase at prices current. Because of the depression through the past six months many stocks have lasted longer than was contemplated, but indications favor liberal buying through June. The advance in Bessemer, though slight, has strengthened the entire market, and concessions on the part of producers tendered a fortnight ago they would not consider to-day. Tool works report an increase of domestic orders, with no falling off of the foreign demand. On the whole the outlook brightens. We quote for cash, f.o.b. cars Cincinnati: Southern coke, No. 1 foundry, $9.25 to $9.75; No. 2, $8.50 to $8.75; No. 3, $8.25 to $8.50; gray forge, $8.25; mottled, $8 to $8.25; No. 1 soft, $8.75 to $9; No. 2, $8.50 to $8.75; Belfont Coke No. 1, Lake Superior $11 to $11.25.; No. 2, 10.50 to 10.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15; Tennessee car wheel, $13 to $14.

Buffalo. Rogers, Brown & Co. say: "There are those who believe that the outlook is brighter and that a turn in the tide, although almost imperceptible, has surely taken place It would be hard to confirm this by either the quantity of business or the prices which are ruling. It, however, can at least be positively asserted that there has been no backward movement of any sort during the past week. Prices remain unchanged and are nominally as quoted below, f.o.b cars Buffalo, on the cash basis: No. 1 foundry, $10.75; No. 2, $10.50; Ohio strong softener No. 1, $10.75; No. 2, $10.50; Jackson Co. silvery No. 1, $14; Southern soft No. 1, $10.75; No. 2, $10.50.

The Late Edward D. Reis.

Brief mention was made last week of the death of Edward Ditridge Reis, manager of Rosena Furnace at New Castle, Pa. On May 23, in the explosion at this furnace, Mr. Reis was badly burned, but he was recovering from his injuries. Erysipelas appeared, however, and death resulted. Mr. Reis was 34 years old. He had had experience in furnace management in the Pittsburg and Birmingham districts, but most of his life was spent at New Castle. Though one of the youngest, he was one of the best known and most capable of valley furnacemen. His father, George C. Reis, was of a family of iron men, and the brothers of the deceased are connected with iron and steel plants—Wm. E. Reis, of the Shenango Valley Steel Co., New Castle; James Reis, of the Red Jacket Furnace, New Castle; John Reis, a Pittsburg furnaceman; George Reis, of the Bay View works of the Illinois Steel Co. Another brother is Jared Reis, of Philadelphia. Mr. Reis is survived by his wife and daughter.

THERE are in the United States 3,196 water works plants, and in Canada 95 plants. The increase in the United States in 6½ years was 1,159, and in Canada 50. Of the 3,196 complete works, 1,690 are owned by municipalities and 1,489 by private corporations, leaving 17 unclassified. One of the most significant changes is the tendency of municipalities to buy up private plants. In six years 19 out of 50 large cities have changed to public ownership and there are only nine important cities, namely, San Francisco, New Orleans, Omaha, Denver, Indianapolis, New Haven, Paterson, Scranton and Memphis, which are dependent upon private ownership for their supply.

THE partnership heretofore existing between R. N. Dickman and Benedict Crowell, at Cleveland, under the firm name of Dickman & Crowell, has been dissolved by mutual agreement. Mr. Dickman will make his headquarters in Chicago in the future, devoting his time to the interests of the firm of Dickman & Mackenzie, who have become well known as analytical chemists, particularly in iron and steel and precious metal work.

THE IRON TRADE REVIEW

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THE DELAY OF PROSPERITY.

The feeling of disappointment over the failure of business to revive in the way many predicted before the election of November is widespread. This feeling exists, moreover, in spite of the fact that the National administration has had the help of none of the enactments which its friends have said from the first were necessary to the restoration of complete confidence and to the quickening of the pace of business. There is some appreciation of the argument that the benefits of a tariff made on protective lines cannot be expected until the new law is passed, and of the fact that active effort toward the establishment of a sound system of finance necessarily waits upon the disposal of the tariff question and the provision of a treasury surplus instead of a deficiency; yet expectations have not been met, as to the business activity that would come from confidence in the new administration and by anticipation of what it is to do for the correction of our fiscal ills. We have believed, and we have said, that too much was expected and too much was promised from the change of administration. We believe, too, that if a new tariff law were passed and in effect to-day there would be less result in prices than many are now predicting. That a great deal will be done for industry aside from establishing our National finances on a solvent basis, through the prompt passage of a tariff bill, there can be no doubt. But the causes of present conditions are complex, and much of the existing impatience comes of a failure to appreciate that some of the hardships now endured will not be removed by tariff or financial legislation.

The annual report of the American Iron and Steel Association, from which we quoted last week, gives as a prime cause of the distrust which capital still manifests, the fact that the ghost of Bryanism has not been fully laid. There is much truth in the suggestion. But we are surprised to find that the official organ of the Amalgamated Association, which says that Bryanism has more life to-day than ever, should contend that this is the result rather than one of the causes of the present condition. It says:

> The reductions in wages, the enforced strikes and lockouts that have shaken the country from one end to the other since the season of fair promises that preceded the campaign was brought to an end, have fallen on the fresh hopes of the industrial classes like hailstones upon the farmer's early grain. The faith in better times and better government that was planted by the campaign orators, and which sprung into a semblance of healthful growth, has since, alas, been broken and crushed and beaten down. The industrial classes are more radical now than ever—more Bryanistic, if you will call it such—but it is a quiet radicalism that springs from violated faith, broken promises and shattered hopes.

Needless to say that the hopes of wage-earners are not the only hopes that have been shattered by the developments of the past five months. The "violated faith" noted above no doubt refers to the reductions of wages by mills which had signed the scale for a year. No word of defense will be written here for such a procedure; but it should be said in justice that the instances are exceedingly rare—probably two or three cases will cover all. Yet the wage reductions in iron working establishments have been in dozens and scores. And they have come, not because employers wanted them, but because of the direst necessity ever put upon the manufacturers of iron and steel. Prices have gone to depths never before touched; profits have disappeared and losses have come in their stead. And this has come on the heels of four years of discouraging business—a time in which many concerns have existed solely because of the momentum of prosperous years. Some of the protests against wage reductions have carried the inference that employers had a choice, and that they are responsible for the reductions in market prices. The forces at work have been far beyond the power of any man or corporation or combination to stay. There were combinations—we do not remember that labor organizations have ever passed resolutions endorsing them—and they kept up prices; but unfortunately they could not furnish buyers for all they could produce, and demand stagnated, while labor had only intermittent employment. The inevitable break came, prices went down, profits, the wage of capital, were eliminated, and as a consequence labor lost a portion of its wage.

It is a grievous mistake to think that Bryanism can cure the condition in which the iron and other industries find themselves. How the men employed in steel works and rolling mills expect to help themselves by agitating for the payment of wages in 50-cent dollars is past finding out. The very statement in their organ that they are "more radical now than ever—more Bryanistic"—is a fresh menace to the capital that might become an active employer of labor. The argument seems to be that because prosperity has not come as expected, its return is to be made the harder.

We find nowhere in the editorial from which we have quoted, nor in any public utterance of Amalgamated Association officers on the wage questions now pending, any recognition of influences in the iron trade, apart from those connected with the tariff—the tinplate duty, for example—and those bound up in the general results expected of the

November election. The proposed advance from 1.2c to 1.4c in the tariff on tinplate is given as the ground for higher tinplate wages—though the market price may not advance at all—yet the radical reductions in prices of products all along the line in the past year are ignored completely. While it is to be hoped that enlarging demand in industries with which the new tariff deals more fairly, will have its effect on iron and steel, permitting of a small profit at each stage of manufacture, there is no reason to look for very considerable advances. None who study the present relation between capacity and demand, and who are familiar with the over-expansion of enterprise in the decade preceding 1892, on which the iron and steel plants of the country were built up to their present proportions, can have faith in any material reaction from to-day's prices. Home demand cannot suffice to do it, and if foreign demand must be depended on more and more to give our iron and steel workers employment, the level of prices, and hence of wages, is pretty well established in advance. Amalgamated Association wages and market prices are out of harmony to-day. If prices do not rise to the basis that justified these wages in the beginning, it would seem that lower wages are inevitable.

While the political side of the industrial experience of the past year has been given an exaggerated importance, and the significance of the revolution in producing costs has not been fully appreciated, there is no question of the part that mutual faith plays in all industrial revivals. It is true, as President McKinley said at Philadelphia, last week, that "resuscitation will not be promoted by recrimination" and that "the distrust of the present will not be removed by distrust of the future." The utterances of the President and those of Secretary Gage give assurance that the administration has steadily in view the duties laid upon it by the American people in connection with the reforming of the tariff and of the currency. The administration says in so many words that currency reform will follow as fast as possible after tariff reform; and meantime optimism will make far better shift of the hardships we have, than agitation and bitterness and distrust. But low prices in iron and steel—measuring by the standard of 1893—will exist after the new tariff and after the establishment of a sounder currency. And yet, even with low prices and low wages, we may still have better conditions than those of the past four years, if the expansion of demand through foreign trade shall give fuller operation to mills and steadier employment to labor.

THE Norway Iron & Steel Co., of New Castle, Pa., formerly the Raney & Berger Iron Co., has made an arrangement for the operation of its furnace at New Castle, with Naylor & Co. the well-known firm of New York and Pittsburg, who will blow in the furnace within a few days. The plant has been idle since last summer and meantime has been modernized and considerably enlarged. Eight additional tuyeres have been supplied, making 16. New engines, new lining and additional equipment have made the plant thoroughly up-to-date and capable of making 350 tons of Bessemer a day. It is understood that under the arrangement just concluded Naylor & Co. will furnish the ore and coke and the local company the limestone and labor, and that each will take half the product.

LAKE SUPERIOR IRON MINES.

Andrew Carnegie responded to a letter from the Mayor of Virginia, Minn., telling of the distress among the miners in that community, by sending a check for $1,000. The letter of transmittal is signed by R. A. Franks, cashier, and the writer says: "Mr. Carnegie wishes me to say that he is very sorry to hear of the distress in your town. He has for years predicted this depression as a consequence of the agitation to lower the standard of value, and he believes there is no cause for the trouble other than the 'silver question.'" Virginia is the location of the Mesabi Mountain and Lone Jack mines, operated by the Carnegie-Oliver interests. The closing of some of the underground properties in this district, due to the profitless basis for ore prices this year, is the cause of the distress. The Mayor of Virginia also wrote to John D. Rockefeller at the same time Mr. Carnegie was addressed. The letters were sent May 6 and Mr. Carnegie's response is dated May 20. A committee of Virginia business men, acting in conjunction with a committee of women, will dispense relief, by means of orders for provisions.

After being idle for nine months the Lillie mine at Negaunee has resumed operations, 125 men going to work.

From the Iron Mountain district, 500 cars of ore a day are sent forward to Escanaba, the shipping mines being the Loretto, West Vulcan, Cundy, Pewabic, Millie, Chapin, Hemlock, Columbia and Mansfield.

Recent records in ore carrying are those of the Queen City, which took 4,843 gross tons of ore from Ashland, and the Siemens, which took 4,769 gross tons from Duluth.

The recent visit of W. R. Burt, Ezra Rust and other fee owners, to Mesabi properties operated by the Lake Superior Consolidated Iron Mines, has put in definite shape the issue as to royalties on some of these mines. Messrs. Burt and Rust, who own the fee of mines in the Lake Superior group at Hibbing, which bear their names, have been asked to reduce their royalty of 30 cents, to conform to a sliding scale of ore prices, with 15 cents as a minimum royalty. It is understood that the fee owners have made a counter proposition, consenting to a reduction of one-third in royalty, on condition that the Consolidated company grant a 25 per cent reduction in the 80-cent freight rate to Duluth. No conclusion has been reached as yet, but it is not believed any reduction in freights will be made this year.

Personal.

R. N. Dickman, of Dickman & Mackenzie, Chicago, recently left on a trip to Mexico, where he has a commission for the inspection of several mining properties.

Joseph E. Schwab, lately superintendent of the 33d street mills of the Carnegie Steel Co., Ltd., has been made assistant superintenent of the Duquesne Steel Works.

THE labor difficulties which have caused idleness in the entire plant of Jones & Laughlins, Ltd., at Pittsburg, were virtually settled by a resumption at the mills on Tuesday. Members of the Amalgamated Association working on a yearly scale were not affected and stood ready to resume as soon as firemen could be found to supply power. By fitting many of the boilers for the use of gas, this was done and a sufficient number of firemen returned to permit the plant to start on Tuesday morning. The men who were notified of a cut include all who work by the day and who are not members of the Amalgamated Association. The wages of all were reduced in the same proportion. Common day laborers who were receiving $1.25 a day will hereafter get $1.12½ and the machinists, open-hearth men, blacksmiths, engineers, structural workers and other classes of skilled laborers whose wages range from $1.50 to $3.50 a day, will work for proportionately less. An adress to the men was issued by the company stating that the continued depression in business and low prices for their product demanded the course taken. Old employes are being given the preference in starting the plant, the company even holding some places for striking employes. Some of the strikers are still holding out, but it is expected the number of working departments will be gradually increased. The men were very orderly and no encounters were reported.

INSTEAD of building another furnace at its Edith furnace plant at Pittsburg, the Oliver & Snyder Steel Co. will begin at once rebuilding the Rosena Furnace at New Castle. So extensive were the repairs needed after the recent explosion that the entire stack will be rebuilt and the whole considerably enlarged. All the recent improvements in blast furnace practice will be utilized and new equipment will be installed throughout. The height will be increased to 100 feet and several feet will also be added to the bosh diameter. The tuyere area will be enlarged by doubling the present number. New ore bins and a new casting house are also contemplated. The work is expected to be completed by Sept. 1.

IRON TRADE STATISTICS FOR 1896.

The general review of the iron trade in the United States in 1896, which forms the introduction to the report for that year of General Manager Swank, of the American Iron and Steel Association, was given in these columns last week. We are now able to present a resume of the statistics of the report, which has come from the press this week. A feature of the statistics for 1896 not found in any previous report is a statement of the production of basic pig iron and of basic and acid open-hearth steel.

Of basic pig iron, the production in 1896 was 336,403 gross tons, of which Allegheny County contributed 168,095 tons; other Pennsylvania counties, 51,768 tons; Alabama and Virginia, 73,604 tons; Ohio and Wisconsin, 20,244 tons.

Basic and Acid Open-Hearth Steel.

Hitherto the statistics of open-hearth steel have been given in a single item. It is gratifying to note that it has been possible to secure returns for 1896 which divide the basic from the acid product. There are, of course, no data to indicate the relative advance of the two processes in the past few years. The information that has been printed in the iron trade papers from time to time, in connection with the building of new plants, has indicated that the basic plant put down was far the larger percentage of the open-hearth capacity added in recent years. It is known, moreover, that the output of basic pig iron has increased materially in these years.

Of the total open-hearth steel production in 1896, 776,256 tons was by the basic process and 522,444 tons by the acid process. Fourteen works made basic open hearth steel only, 38 made acid open-hearth-steel only and 17 works employed both processes. The table below shows the production, in 1896 and the five preceding years, of open-hearth ingots and direct castings:

States—Gross tons.	1891.	1892.	1893.	1894.	1895.	1896.	Basic, 1896.	Acid, 1896.
New England.	14,316	18,620	24,759	26,204	36,733	48,055	19,021	29,034
New York.....	18,499	19,511	17,591	21,363	32,203	32,120	9,379	22,741
New Jersey..								
Pennsylvania .	472,607	551,010	616,516	659,969	904,352	1,009,608	632 429	377.179
Ohio.....	51,524	60,834	50,385	54,182	75,637	64,691	11,700	52,991
Illinois	22,807	19,914	28,639	23,218	49,500	101,832	84,804	17,028
Other States.					38,757	42,394	18,923	23,471
Total.....	579.753	669,889	737,890	784,936	1,137,182	1,298,700	776,256	522,444

The notable increase in the production of Illinois and the fact that basic steel was so large a part of its 1896 product indicates that a great gain was made by the basic process in the Chicago district. It is known, moreover, that in the Pittsburg district considerable additions of basic furnaces were made in 1896.

Rolled Iron and Steel.

The production of all iron and steel rolled into finished forms in the United States in 1896, this including all nail plate and wire rods, was 5,515,841 gross tons, a decrease from 1895 of 673,733 tons, or over 10 per cent. Pennsylvania made 56.8 per cent of the total production in 1896, against 56.4 per cent in 1895. Ohio made 13.9 per cent in 1896, against 14.4 per cent in 1895; Illinois, 10.7 per cent, against 10.1 per cent; Indiana, 3.5 per cent.

PRODUCTION OF STRUCTURAL SHAPES.

The statistics of production of iron and steel structural shapes are as follows:

States—Gross tons	1895.	1896.	States—Gross tons.	1895.	1896.
New England..			Illinois.....		
New York.....	22,426	17,753	Wisconsin.....	.....	7,020
New Jersey			Minnesota		
Pennsylvania ...	464,410	446,246	Colorado	5,254	4.499
Kentucky			California.....		
Tennessee	7,413	1,892			
Alabama					
Ohio.....	18,417	18,161	Total.....	517,920	495.571

The 1896 production of plates and sheets came very close to that of 1895, considering that the latter was the boom year—the totals being 965,776 and 991,459 tons respectively. In sheets thinner than No. 25, 1896 went well ahead, largely owing to the growth of the native tin plate industry, the total of these gauges being 304,054 tons in 1896 and 229,130 in 1895. The production of "black plates for tinning" in 1896 was 185 387 gross tons, against 129,615 tons in 1895, an increase of 43 per cent.

ROLLED PRODUCTS IN PENNSYLVANIA AND OHIO.

Interesting for comparison is the statement of the rolled products of 1896 in Pennsylvania and Ohio, by districts, in gross tons:

	1892.	1893.	1894.	1895.	1896.
Philadelphia	102,411	96,950	80,345	114,759	106,404
Eastern Pennsylvania...	576,111	415,277	335,993	466,919	344,471
Central Pennsylvania....	687,005	656,892	567,052	671,571	575,713
Allegheny county.....	1,437,096	1,249,564	1,350,608	1,813,216	1,675,182
Western Pennsylvania..	499,883	444,150	385,798	485,470	436,374
Total.....	3,302,506	2,862,833	2,719,796	3,491,935	3,138,144
Ohio Lake counties.....	322,972	233,795	250,345	407,569	339,606
Mahoning Valley.....	323,908	204,896	165,336	293,926	218,623
Interior counties	81,129	77,478	65,798	90,454	70,148
Ohio River counties.....	160,784	123,715	95,601	101,716	138,643
Total	888,793	639,884	577,080	893,665	767,020

A summation of the statistics of the year is given in the following interesting table, with comparison with 1895:

SUMMARY OF IRON AND STEEL STATISTICS OF THE UNITED STATES FOR 1895 AND 1896.

	1895.	1896.
Production of pig iron, including spiegel and ferro, gross tons.....	9,446,308	8,623,127
Production of spiegeleisen and ferro-manganese, gross tons.....	171,724	131,940
Production of bar, hoop, skelp, etc., and structural shapes, gross tons, not including wire rods.....	3,005,765	2,731,932
Production of iron and steel structural shapes, included above, gross tons	517,920	495,571
Production of iron and steel wire rods, gross tons,	791,130	623,986
Production of plate and sheet iron and steel, except nail plate, gross tons.....	991,459	965,776
Production of iron and steel cut nails and cut spikes, kegs of 100 pounds.....	2,129,894	1,615,870
Production of iron and steel wire nails, kegs of 100 pounds.....	5,841,403	4,719,860
Production of all rolled iron and steel, including cut nails and excluding rails, gross tons.....	4,883,439	4,393,831
Production of all rolled iron and steel, including both cut nails and rails, gross tons	6,189,574	5,515,841
Production of Bessemer steel rails, gross tons	1,299,628	1,116,958
Production of open-hearth steel rails, gross tons....	697	705
Production of iron rails, gross tons.....	5,810	4,347
Production of all kinds of rails, gross tons	1,306,135	1,122,010
Production of street rails, included above, gross tons	163,109	145,210
Production of Bessemer steel, gross tons	4,909,128	3,919,906
Production of open-hearth steel, gross tons.....	1,137,182	1,298,700
Production of crucible steel, gross tons.....	67,666	60,689
Production of blister and patented steel, gross tons	856	2,394
Production of all kinds of crude steel, gross tons...	6,114,834	5,281,689
Production of ore, pig, and scrap blooms for sale, gross tons	7,225	7,840
Production of tin plates for year ended June 30, lbs.	193,801,073	307,228,621
Value of imports of iron and steel	$25,772,136	$19,506,587
Value of exports of iron and steel	$35.071,563	$48,670,218
Production of iron ore, gross tons.....	15,957,614	.....
Imports of iron ore, gross tons.....	524,153	682,806
Total consumption of iron ore, gross tons.....	17,253,000	15,525,000
Shipments of anthracite coal from the mines in Pennsylvania, gross tons.....	46,511,477	43,177,485
Imports of anthracite and bituminous coal, gross tons.....	1,364,016	1,349,557
Exports of anthracite and bituminous coal, gross tons	3,682,693	3,626,202
Iron and steel ships built in the fiscal year ended June 30	43	60
Miles of new railroad completed.....	1,922	1,850
Immigrants in the year ended December 31.....	324,330	301,067

THE Ohio Institute of Mining Engineers has arranged a pleasant and profitable trip for its regular summer excursion. Leaving Columbus at 11:35 A. M., Tuesday, June 15, the Institute will go over the Columbus, Sandusky & Hocking Road to Sandusky, where the methods employed in loading vessels will be observed. If there is time a visit will be paid to Kelley's Island, to note evidences of the great glacier which covered this region. On Wednesday, boat will be taken to Huron and the W. & L. E. docks will be visited. Thence the party will go to Lorain and will be entertained at lunch by the Johnson Co. In the afternoon the steel works will be inspected, and the Lorain docks will be visited. Thursday will be spent in visiting the coal and ore docks of Cleveland and examining the various quick-loading appliances now in operation.

IN the United States Court at Nashville, Tenn., the suit has come up of the Government against the Associated Pipe Works, brought under the anti-trust act. The association has six members, the Addyston Pipe & Steel Co., of Cincinnati; Dennis Long & Co., of Louisville; South Pittsburg Pipe Works, of South Pittsburg, Tenn.; Chattanooga Foundry & Pipe Works, of Chattanooga, Tenn.; Anniston Pipe Works, of Anniston, Ala., and the Howard Harrison Iron Co., of Bessemer, Ala.

PUBLICATIONS RECEIVED.

W. S. Rockwell & Co., 26 Cortlandt street, New York, present a description, with illustrations, of their improved duplex system for burning fuel oil, in a 30-page pamphlet 7½ x 9⅞ inches. After stating the value of oil as a fuel, the various lines of manufacture in which it can be advantageously employed are named and the features of the duplex system given in detail. The Rockwell burner is made of brass, nickel-plated, and the nozzles are of a durable composition. It can be used for steam or air, the choice of agency for atomizing the oil depending on the purpose for which the oil is used. "The prime object is the destructive atomization of the oil and its intimate association with the oxygen of the atmosphere within the furnace chamber at the proper time, its expansion and vaporization under heat, and final entrance into combustion. The destructive force of steam at 90 pounds pressure is about six times as great as air at fifteen pounds. The temperature of such steam is about six times as great as atmospheric air of average temperature, and its expansive power many times greater. The elements of steam, two volumes of hydrogen and one of oxygen, in proper proportions with the carbon of the oil, are favorable to combustion of a high order. The volume of steam necessary to properly atomize a certain quantity of oil is less than half the quantity necessary to operate an air compressor to accomblish the same atomization with air. The first cost and maintenance of the steam method as compared with the air method are as the cost of a small iron pipe to a large and complicated machine. The compression of atmospheric air adds no more to combustion than the same weight of free air other than by its atomizing or destructive force. The oxygen of free air in its exhaustless abundance will, under proper conditions, enter into combustion with carbon as freely and rapidly as that of compressed air." Illustrations are given of hardening and tempering, annealing and hardening, regenerative forge, regenerative heating, brazing, and single-end and double-end annealing furnaces. The heating of rivets with oil fuel is one line in which the Rockwell apparatus has done good work, oil, it is claimed, heating a rivet softer and with less scale than any other fuel.

Alder & Ruley, of Philadelphia, issue their annual handy volume of coal statistics, giving directories of all mines in the United States, with statistics of production, distribution and other matter of interest to the trade. The price is 50 cents.

An elaborate catalogue has been issued by the Hawley Down-Draft Furnace Co., of Ohio, containing over 200 pages of half-tone cuts and descriptions of important plants in which the Hawley furnace is used. The adaptation of the furnace to use with all forms of boiler is shown by means of cuts of the well-known types, with the Hawley furnace attached. The volume contains records of various tests made upon boilers equipped with this furnace, the results demonstrating economy, increased capacity and smokelessness. The headquarters of the Ohio company are at 328 W. Pearl street, Cincinnati, with branches in Cleveland, Louisville and Indianapolis.

The J. D. Smith Foundry Supply Co., Cincinnati, in its catalogue No. 10 gives 225 pages of illustrations, descriptions and price lists of a great variety of supplies and mechanical appliances for foundry use.

The Goheen Mfg. Co., Canton, O., sends out a booklet which discusses the question of the proper coating for iron and steel structures under the title, "The X Rays Turned on our Skyscrapers." With a recent paper before the American Society of Mechanical Engineers as a text, the pamphlet points out the danger from the rusting of the steel work of tall buildings, and discusses the make-up of proper protecting material. The carbonizing coating manufactured by the Goheen Mfg. Co. is referred to as a chemical combination of pigments and chemically prepared linseed oil.

In introducing its catalogue No. 28, the Murray Iron Works Co., of Burlington, Ia., refers to the result of its investigations in the Corliss engine field, which led to acquisition of the patterns, patents, machinery, designs, etc., of the Sioux City Engine & Iron Works. A new machine shop was built at Burlington adjoining the old works and it was equipped with modern machinery and appliances, making it one of the few machine shops in the country devoted exclusively to the building of Corliss engines. The pamphlet is liberally illustrated, each important part of the engine being shown and its advantageous features indicated. Several half-tone cuts of completed engines are also given. The company also manufactures horizontal tubular boilers, which are shown in illustration, and is prepared to furnish power plants complete.

THE TIN PLATE MARKET.

The market for tin plates is in a very uncertain and unsettled condition, with prices for near-by deliveries considerably firmer than for futures. The demand of the Amalgamated Association for an advance of about 15 per cent after July 1 will probably result in a general shut-down of all works as the manufacturers, at their recent meetings at Cleveland and Pittsburg, have decided that they cannot accede to the demand because the trade conditions and the prices now ruling will not allow it. Buyers needing plates for July and August are growing anxious and are making efforts to get in plates enough to carry them through, with the result that June and July deliveries are quoted fully 15 cents per box above futures, and very few plates can be had at any price for those months as the mills are not only well supplied with orders up to July, but many of them are reported to be behind in their deliveries up to the present time.

The negotiations between the makers and large jobbing interests in New York have been the subject of considerable comment among the trade and it is generally understood that an attempt is being made to secure co-operation between these dealers and the mills with the view of marketing the product of the mills to better advantage and thus maintaining more uniform prices. This movement is favorably looked upon by the larger users of tin plates, who claim that a firm, steady market would be much better for them. The past year has shown wide fluctuations in prices and a buyer never has known if his purchase was at the bottom, for the next week some hungry mill would perhaps cut the price 10 to 15 cents per box and demoralize the whole market. Nothing has been given out concerning the negotiations, but the opinion seems to prevail that an agreement of some kind will be reached.

The prices quoted by the association mills are on a basis of $3.35 for 14 x 20, 100-lb. delivered, but plates are freely offered for delivery August to December at 7½c to 15c less, and several large purchases are reported to have been made by Western buyers, deliveries in some instances running through to first quarter of 1898.

We quote as follows, for June and July delivery in Central and Western districts:

CHARCOAL TINS.

	IC	IX
Lisvane Grade,	$4.05	$4 80
Calland Grade,	4.25	5.00

COKE TINS.

Full weight, basis weight,	$3.45
100 lb. " "	3.35
95 lb. " "	3.30
90 lb. " "	3.25
85 lb. " "	3.22½
80 lb. " "	3.20

TERNES.

Full weight.	14 x 20	$3.35
	20 x 28	6.70
100 lb.,	14 x 20	3.25
	20 x 28	6.50

Black plate, per 100 lbs., $2.30.

In comparison with the above we quote the following prices upon well-known grades of imported plates f. o. b. New York City:

CHARCOALS.

Melvyn Grade, imported f. o. b. New York,	IC	$4.62½
Grange " " " "	IC	4.00
Allaway " " " "	IC	4.00

CHARCOAL TERNES.

M. F., 20 x 28, imported f. o. b. New York,	$12.00
Worcester, " " "	8.25

WASTER TERNES.

Alyn Grade, imported f.o.b. New York,	$6.20

COKE TINS.

Bessemer, IC	14 x 20, imported f.o.b. New York IC	$3.90
" " "	" " "	100 lb., 3.70
" " "	" " "	90 lb , 3.40
Siemens squares,	" " "	IC basis, 4.00
" "	" " "	100 " 3.80

CENTER BLAST FOR CUPOLAS.

The discussions at the recent National convention of foundrymen at Detroit did not get into the question of the efficiency and economy of the center blast cupola, probably because of the fact that, along with physical and chemical test methods, this subject has been given generous attention in the past year or two. However, there was more or less interchange of opinion on center blast by attendants at the Detroit convention, some doubts being expressed as to the net results. The same week of the Detroit convention the Iron and Steel Institute was in session in London, and one of the papers there presented related to central blast. It was written by Mr. Thos. D. West, who has been a leading advocate of central blast in connection with blast through outside tuyeres. We give this paper below, and with it a brief description of the recently altered form of center blast cupola designed by Chas. Johnson, of Springfield, Mass:

General Utility and Economy of Central Blast Cupolas.

Some three years ago the author introduced in cupola practice an improvement, which consisted in providing a central tuyere coming up through the bottom of the cupola in conjunction with outside tuyeres for the purpose of improving the distribution of blast. The results of the experiment were so favorable that greater economy and cleaner working were obtained than in any other form of cupola known to the author. He therefore continued to use it, trying different modifications to ascertain what might be achieved in different conditions of cupola practice.

The advantage of having a tuyere carrying blast up through the center of the cupola will be obvious to anyone who closely watches the action of cupolas as the last charge approaches within four or five feet of the outside tuyeres. He will then see that the greatest heat and flame is obtained right above the tuyeres at the outer circumference of the fuel, the central portion being left much less active in live combustion. Moreover, by watching the blast blowing-in into the bed of fuel before any iron is charged, he will notice a similar action. Again, another test is to stand inside a cupola after the bottom plate is put up, before any fuel is charged in. The blast is then allowed to enter with all its force, and a handkerchief may be held in the hand at some distance from the tuyere entrance without being moved by the blast. This last test will be a source of surprise to many, as frequently in large cupolas a handkerchief will not be affected by the blast if held a foot away from the cupola walls.

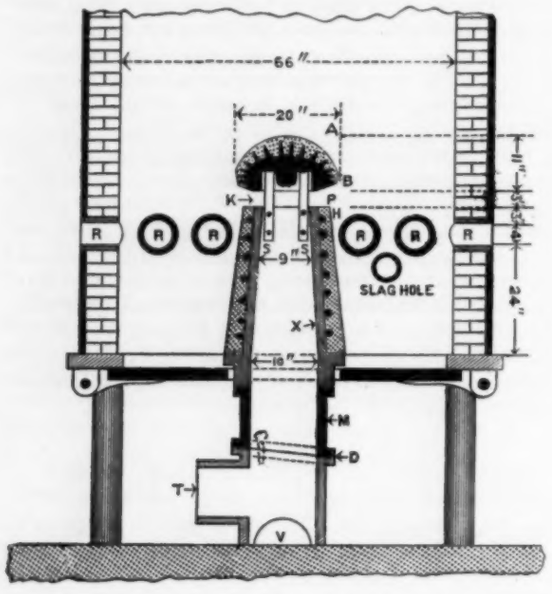


FIG. 1.—WEST'S PERMANENT CENTER-BLAST-TUYERE CUPOLA.

The advantages consist in permitting a more uniform distribution of the blast throughout the fuel in the cupola, and also in permitting the use of a greater volume of blast with a decrease of pressure. This with cold blast is less effective in choking the tuyeres or in chilling the fuel round and in front of the tuyeres. The author's experience with central blast clearly shows that, for economizing fuel and for securing clean and fast melting, it is not so much the pressure but a well-distributed volume of blast that is necessary.

This feature is confirmed by the fact that in several blast furnaces in the United States the output is being increased by a larger number of tuyeres having been put in, so as to give a better distribution of blast. Grace Furnace, at Briar Hill, O., has increased its daily output from about 270 to 300 tons, the increase having been brought about by the tuyere space having been divided, so as to insert the tuyeres closer together and to increase their number from eight to twelve. Before the number of tuyeres was increased their pressure ranged from 15 to 18 lbs., but with the greater tuyere area it fell about 2 lbs. The speed of the engine was kept the same, so that it is evident that it was a better distribution of blast volume, and not pressure, that was wanted in this case to give the best results.

The theoretical percentage of fuel said to be necessary for melting one ton of iron in a cupola is 59 lbs. Experience shows, however, that if a ton of iron can be melted with an average of 200 lbs. of coke or coal, good work is being done. The uneven distribution of the blast is the greatest drawback to obtaining the best economy of fuel. If it were possible to place fuel on grates in a cupola, and then to have blast enter in equal volume all over the area of the cupola, as is done with grate bars in boilers with closed ash pit and forced draught, and further, if it were possible to generate carbonic anhydrate in the upper strata of escaping gases by admittance of the air on the plane of the upper tuyeres in cupolas as uniformly as the air could be admitted up through the grate, it might then be expected that the melting would be achieved with the theoretical quantity of fuel necessary. As, with the present state of knowledge, this is impossible, it is necessary to return to the central blast combined with outside tuyeres, an arrangement which is claimed by the author to be the most economical for such purposes.

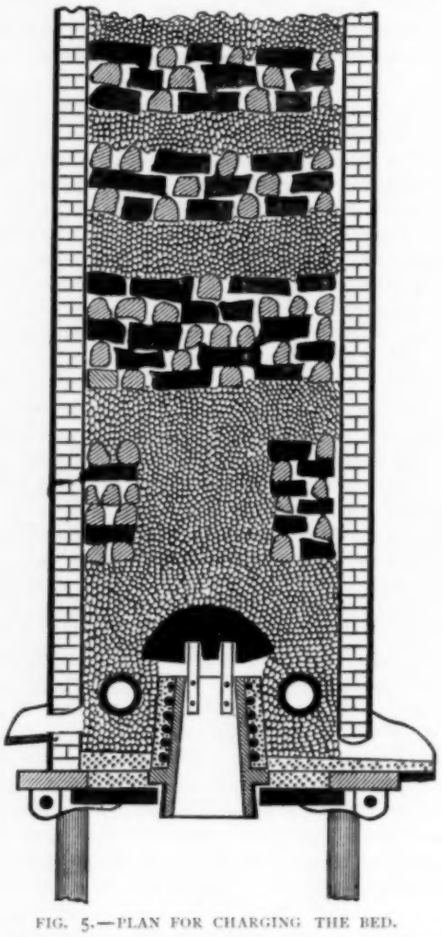


FIG. 5.—PLAN FOR CHARGING THE BED.

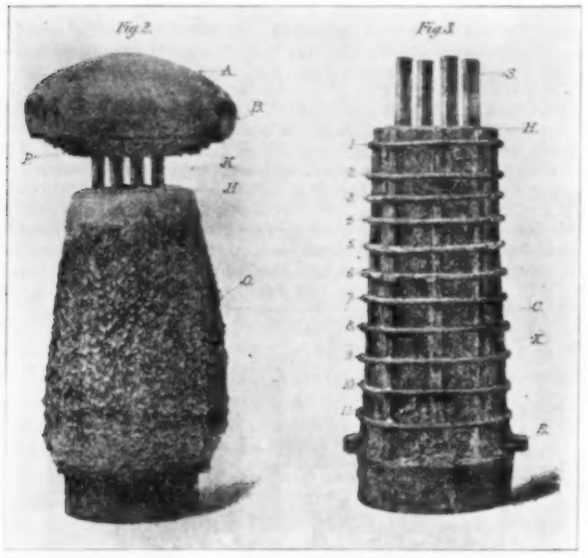
Since the author has introduced central blast in cupola practice, others have adopted the principle by using central blast alone, that is to say, independently of outside tuyeres. It is obvious, however, that this plan prevents the even distribution of blast that is desirable, and, moreover, the centra

tuyere would soon be so choked as to retard or to wholly stop the melting. In all cases where cupolas have an inside diameter of more than 50 inches, whether they run short or long heats, the central blast should be combined with outside tuyeres. Cupolas that are not expected to run much an hour, and are of smaller size, may economically be worked with central blast alone. In no case, however, where heats have to be longer than an hour and a half, is central blast to be recommended to be used alone. The best results are obtained with central blast cupolas of a larger size.

ECONOMY.

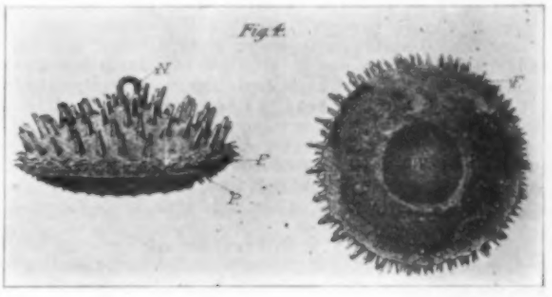
The sources of economy obtained by the use of the central blast, with outside tuyeres, may be enumerated as follows: 1. Greater economy in fuel. 2. Less destruction of lining. 3. Increased speed of melting. 4. Saving in labor in preparing a cupola and in shoveling out refuse. 5. Less waste of chilled iron and fine shot. 6. Greater absence of flame escaping from the stack at the closing or other parts of a heat. 7. Less absorption of sulphur. 8. Greater freedom for the admission of blast, and less labor in keeping the tuyeres open. 9. As hot and clean iron is obtained at the end of heats as at the beginning.

The first result is brought about by there being less space for fuel in the body of the cupola below the level of the tuyeres, and by there being a more uniform distribution of the blast throughout the fuel, and, again, by the tuyere openings being freer to admit the blast. Moreover, the fact that the central tuyere openings are at a higher level than the outside tuyeres causes the carbonic oxide formed in the lower portion of the cupola to be reduced to a greater quantity of carbonic anhydride. The saving of the linings is due to there being a less force of blast, or, in other words, less volume of carbonic anhydride playing against the lining, owing to its being distributed more uniformly throughout the body of the fuel in the cupola. The speed of melting is increased, owing to the fact that there is greater freedom for the admission and more uniform distribution of the blast throughout the fuel. There is also a smaller quantity of carbonic oxide escaping. Labor is saved because less chilled material is formed round and in front of the tuyeres, owing to a more uniform distribution of the blast. Another reason for economy in labor is that there is less burning out of the cupola linings, and less refuse to be shoved out from the under the cupola at every bottom drop. The lessened waste in chilled iron and fine shot is due to the higher temperature during and at the end of a heat largely preventing or melting away what chilled stock may have gathered round or in front of the tuyeres during the process. Moreover, the milder distribution of blast throughout the fuel does not give rise to excessive bodies of dead or chilled material in front of the tuyeres to adhere to the sides of the cupola, and so to lessen the melting area. The greater absence of flame at the charging door and stack is due to the more thorough combustion in the melting zones, owing to the fact that the carbonic oxide formed in the lower portion of the cupola is more completely converted into carbonic anhydride before it reaches the charging door. This is so distinctly marked at the end of a heat that the blast may not cause the least sign of flame to emanate from the stack, provided that the central tuyere has its blast properly regulated, in order to prevent it becoming choked. By proper manipulation of the blast valves, the combustion can be made so perfect that at the end of an operation the intense heat at the melting zone will prevent a look into the cupola, and but little sparks or flame will be seen escaping at the stack. Less absorption of sulphur is caused in a similar manner. The more sulphur there is in fuel, the more can iron be expected to absorb; and it follows that the less fuel there is used, the less sulphur may be expected to be absorbed by the iron, owing to the central blast diminishing the ratio of the fuel to the iron extracted, and giving hotter iron. The greater freedom for admission of the blast and the less labor involved in keeping the tuyeres open is the result of there being less chilled iron and refuse collected in front of the tuyere openings. The increased fluidity of iron is due to the more perfect combustion and to the walls of the cupola being brought up to a higher uniform temperature throughout the body of its lining. It is also due to the greater freedom from chilled or dead material collected round and facing the tuyeres, diminishing the area of a cupola available for live fuel during the progress and end of a heat.



CONSTRUCTION OF CENTRAL BLAST CUPOLAS.

In the latest form of central blast cupola adopted by the author, the central tuyere is so designed as to form a permanent structure which remains in its place when bottoms are dropped. Its construction is shown in Figs. 1, 2, 3 and 4. It is obvious that such a design would be unsuitable for cupolas under 50 inches in inside diameter. Illustrations of designs suitable for smaller cupolas have been published in the author's treatise on the "Metallurgy of Cast Iron." In all cases it is of the utmost importance to have outside tuyeres in addition to the central one.



Some difficulty has been experienced by iron founders, who have adopted central blast something after the author's design, with the burning out of the covering cap shown at A (Fig. 1). The author has no knowledge of the type of cap used in these cases. At his own foundry, however, he has had the same cap casting in use in the 66-inch cupola (Fig. 1), running daily heats ranging from 50 to 70 tons, since October, 1896, up to the present time (March, 1897), and it is in as good condition as it was when first put in position, and its design has not given rise to the slightest trouble.

Many imagine that, on account of its being incased in the center of a cupola surrounded by incandescent fuel and molten iron, the central tuyere would be unable to resist for any length of time the heat surrounding it. A study of the conditions obtaining shows, however, that when all is working regularly such a tuyere is not subjected to a temperature high enough to burn or melt the tuyere lining. In fact, the temperature at the lower portion of the central tuyere is not much higher than that to which the lining of the ladle holding molten metal is exposed. It may also be said that as long as the top of the covering cap is not extended too high above the level of the outside tuyeres, it is not subjected to a much higher temperature than the lower portion. One reason, no doubt, why many have experienced trouble with covering caps is that they have carried them up too high, so as to bring them up close to the melting zone. The central tuyere's

blast opening should never be carried more than three to six inches above the level of the outside tuyeres.

In order to still further obviate any danger of injury to the cap, the author has adopted, with complete success, a method of charging, which consists in placing the first charge of iron in the form of a circle with a hole in the center equal to the diameter of the covering cap. This is then filled with fuel (see Fig. 5), instead of having the center all iron, as well as the outer portion, as is the usual practice.

It is also advisable to protect the edge at B (Figs. 1 and 2) by placing, as shown at F (Fig. 4), pieces of ¼-inch round iron and nails, projecting about an inch, placed together as closely as they can be cast in, and then daubed over with clay. Not only is the edge of the covering cap protected in this way, but the whole body of the casting is prepared in a similar manner. The iron prickers shown should project 2 to 3 inches from the body of the cap casting. The casting should not be less than 1¼ inches in thickness at any part; it should be 3 to 4 inches larger in diameter than the top of the central tuyere at H, in order to prevent molten iron dropping from the cap and leaking into the tuyere. The space between the cap and the top of the central tuyere for the admission of blast should be 2½ to 3½ inches; the longer the heats the greater should be the width of the opening. The under side of the covering cap at P (Figs. 1, 2 and 4) may have short projections of about ½-inch cast on it, and daubed over with clay. But as the cold blast is constantly playing against this surface, there is little danger of it becoming too hot if cupolas are kept fairly steadily in blast. In cases where they are left to stand an hour or two without the blast being on, it is advisable to prepare the under side of the cap as described. In order to support the cap in place, 1½-inch pieces of square wrough-iron bars are bolted to the central tuyere, as shown at S (Figs. 1 and 3). A recess of about 3 inches deep by 1¾ inches wide is cast in the cap piece (Figs. 1 and 4), as shown. This recess, being circular, permits the cap to be fitted over the 1½-inch support (Figs. 1 and 3) at any point, and prevents the bending inward of the bars, S, should they become heated red hot from any cause. The test applied at our foundry has been a severe one, for the lengths of heat are not merely of an hour or so duration, but range from four to five hours. The results tend to show that central blast, as described above, might be made to run day and night with perfect safety for a week at a stretch, as is necessary in running cupolas in Bessemer practice.

It will be noticed that, for the sake of clearness, the connections for bringing the blast to the outside tuyeres are not shown in Fig. 3. It is, however, necessary that dampers or valves should be provided, so that the central and outside tuyeres can be worked together or separately, so as to regulate the blast pressure at will. Where long heats are run, there is a liability of the central tuyere chilling the stock at K. This difficulty can readily be obviated by shutting off the blast for a short time from the central tuyere, so as to permit the heat of the cupola to melt any chilled material that might be clogging the opening of the central tuyere at K. Sometimes a piece of half-melted iron may lodge in front of the opening at K, and obstruct the fluid iron in its direct descent to the hearth of the cupola. The escape of sparks, etc., down a central tuyere caused in this manner can be stopped almost instantly by increasing the blast pressure in the central tuyere. The door, V, is so arranged as to be readily opened or closed, in order to permit the removal of any iron or slag that may have penetrated to the bottom of the shaft of the central tuyere.

Some little experience is necessary to work central blast to the best advantage; with a little practice, however, the manipulation is soon acquired. When a new cupola is to be designed with central blast, it is best to have the outside tuyeres continuous in their opening, as in the Mackenzie cupola, in place of pocket tuyeres, as shown in the round form depicted in Fig. 1. A better distribution of the blast round the outer circle of the fuel is thus effected.

The central tuyere itself can be made all of cast iron, or of boiler plate. For a permanent structure a cast-iron tuyere is preferable, as it presents greater rigidity, and as it is made at less cost. The central tuyere, as at X (Figs. 1 and 3), is made about an inch thick, with ribs throughout its length on the periphery (as shown at C, Fig. 3), in order to sustain wrought rings of ¾-inch iron for supporting the clay, which is about 3 inches thick. These rings are shown in position in Fig. 3. Cast-iron projections or prickers have been tried in place of these rings, but the inconvenience of casting them on to the body of the tuyere renders them undersirable. Fig. 2 shows the central tuyere, with its covering cap daubed over with clay ready for a heat, or as they would appear in position on the base in Fig. 1. The base is made in sections, so that the section, M, can be removed if anything goes wrong with the central tuyere. The main body of the tuyere could then have its lower portion stopped with clay, it being necessary for this purpose to place a large lump on a plank levered so as to press it upwards into the interior. It would then be tightly closed against the ascent of iron or blast, and the heat could be finished by the use of the outside tuyeres only. It will, of course, be understood that this is only a precaution against an accident that might never occur.

With central blast we have effected at our foundry a saving in fuel of over 30 per cent. Apart from this economy, the advantages enumerated at the beginning of this paper are sufficient to warrant the adoption of central blast. The type of cupola used at our foundry is shown in Fig. 1, the dimensions on the right side indicating the height at which the openings of the central and outside tuyeres are placed.

The outside tuyeres were recently raised about six inches. This enabled the cupola to contain a larger mass of metal, and at the same time there was more space between the slag hole and the outside tuyeres. Where long heats have to be run it is especially important to have a good space between the slag hole and the outside tuyeres, as, when they come close together, it brings the slag up to a level where it is readily chilled by the incoming cold blast from the outside tuyeres. This may eventually lead to the tuyeres becoming choked.

In conclusion, the author would point out that this paper is merely a supplement to his previous writings on the same subject. He trusts, however, that the new illustrations and treatment of the subject now brought forward may afford further proof of the general utility and economy of central blast for cupolas, and also lead to its more general adoption.

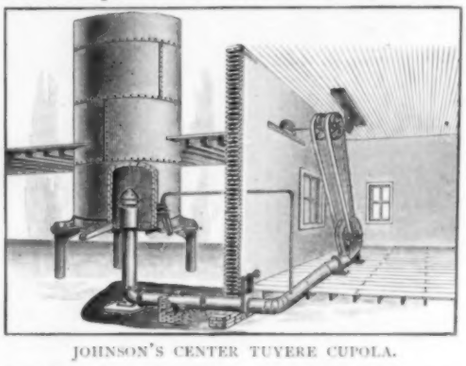
Note.—Any having cupolas over 50 inches inside diameter, that would like to give the center blast a test, can have the writer's assistance gratuitously by directing to him at Sharpsville, Pa., the inside diameter, height and form of tuyeres, distance from the floor level to the under side of drop door, plan of the drop doors, also weight of heats and kind of iron and fuel used.

Johnson's Improved Center Blast Cupola.

The original center blast cupola, designed by Chas. Johnson, formerly superintendent of the Howe Scale Co.'s plant at Rutland, Vt., and now connected with the Bausch & Harris Machine Tool Co., of Springfield, Mass., has already been described in these columns. Some improvements have been made recently and these are indicated in the accompanying cut. Of the improved device Mr. Johnson writes:

"This center blast tuyere is very simple in construction, and practical demonstration has been given of its utility. The patent, which has just been allowed, includes many improvements. The upper end of the center blast pipe is provided with a cap, made with a series of apertures or perforations, to permit the air from the center blast pipe to pass out through the cap by way of the perforations, to insure a complete combustion of the fuel in the immediate neighborhood of the cap. Thus the air forced through the pipe by the blower can pass through the two tuyere openings and between the two sections as shown, and a part of the air can pass through the perforations into the fuel surrounding the cap.

"In order to prevent the molten metal from flowing into



JOHNSON'S CENTER TUYERE CUPOLA.

the center blast pipe, I provide a safety device, as shown, attached to the outside shell of the cupola, which has a removable bottom with an opening normally closed by an easily fusible metal, such as lead or zinc. This safety device is placed on the outside of the cupola and adjusted a short distance below the tuyere openings. Thus any molten metal not drawn off at the proper time through the tap hole will pass at once into the safety device, melting the fusible bottom, or plug, and escaping into a spout which is attached to the under side of the safety device, and will thus do no harm. This tuyere is so arranged that it can be attached to any cupola without making any changes, except in the drop doors, and when once attached it is as permanent as the cupola itself.

"Among other advantages claimed are these: The saving of fuel; saving of brick lining; more rapid melting, with less volume of blast; a more even temperature of iron than can be obtained by the use of outside tuyeres; that, by reason of melting iron hot and soft, it permits of the use of much more scrap; the cupola does not have to be picked out when a little limestone is used; also, that the cupola drops clean.

"This center tuyere is doing exceptionally good work in some of the best foundries, including the Howe Scale Co., of Rutland, Vt.; the Holyoke Machine Co., of Worcester, Mass.; Rensselaer Mfg. Co., of Troy, N. Y.; Struthers, Wells & Co., of Warren, Pa.; the N. E. Parsons Co., of Bridgeport, Conn. The question of a center blast tuyere has been investigated and discussed by foundrymen for a number of years, but heretofore without any practical result. This device seems to have solved the problem, and what was once theory is now a demonstrated fact."

MAKING AND CARE OF CRUCIBLES.*

BY JOHN A. WALKER.

To the last half of the 19th century, just closing in such a blaze of metallurgical and industrial glory, belongs the graphite industry; so much so, in fact, that graphite has become one of the great factors in our modern civilization. To speak mineralogically, graphite belongs to the coal family, and is classified with the carbon minerals. To speak chemically, it is a pure carbon, and has substantially the same analysis as charcoal and the diamond. To speak geologically, it occurs only in the oldest archaic rocks, and is the product of an unmeasurable heat. To speak electrically, it is one of the best conductors of the subtle electric current. And to speak colloquially, it has entered every civilized home in the form of stove polish for the kitchen, and the lead pencil for the library.

It has revolutionized methods in metallurgy by its use in the making of crucibles or melting pots. As a mineral it crops out all over the globe, but as an ore of a suitable quality, and in sufficient quantity to pay for mining and refining, it is confined to three or four well-known localities. The most notable product of the graphite industry for foundrymen is the graphite crucible, or melting pot. Hence the subject assigned to me is "Crucible Making, and How They Should be Cared For."

Crucibles or melting pots, of some description, have, of course, been used since the first fusion of metals by man. We all know the legend that the earlier alchemists marked their crucibles with a cross (hence the word "crucible"), to prevent the devil from interfering with the chemical operations about to be performed. This legend, whether true or not, shows the antiquity of the melting-pot.

History of the Graphite Crucible.

Before the present century, crucibles were made chiefly of sand and clay, but what we know as the modern graphite crucible, more commonly known as plumbago, or black lead, was originated in the year 1827 by Joseph Dixon, then living at Salem, Mass. So it is to the present century, and to an American, that the world owes this useful invention. In its broadest sense, a crucible is the vessel in which a fusion of some substance is conducted. Crucibles differ widely, according to the substance to be fused and the object of the fusion. They differ in composition, shape, and size, from the tiny platinum crucible of the laboratory, and the average melting pot for brass or steel melting, to the 50-ton hearth of the modern steel furnace.

Crucibles are used in every laboratory and every scientific shop, but chiefly in the foundry for the fusion of metals and alloys. There are now in use, in various parts of the world, platinum crucibles for laboratory work, sand crucibles so-called, made from Hessian clay and sand, straight-out clay crucibles made from English clay, and the melting pot known to all foundrymen as the black lead, or plumbago, crucible, which is, more correctly speaking, the graphite crucible.

While the use of the Hessian sand crucible still lingers among assayers, and while English steel makers still cling to the use of the one-heat clay crucible, the vast bulk of all the metals and their alloys is fused in the modern graphite crucible.

As before mentioned, graphite crucibles were first made in 1827 by an American. Later the American taught the Englishman, and still later the practice traveled to France and Germany, Japan and China; and now, to the best of my knowledge, the making of the graphite crucible is confined to France, Germany, England, Japan, China, and America. America, however, has taught the world.

The theory of the graphite melting pot is that, vastly better than anything else, it is a ready conductor of heat, and at one and the same time it is both strong and elastic. Again, it is refractory and durable. Being the best conductor of heat, the coal bill is minimized and quick melting made possible. Being strong and elastic, it stands all reasonable shocks and accommodates itself to radically different temperatures. Being refractory, the most stubborn metals succumb and become fluid long before the walls of the pot show the slightest sign of collapse.

Points for the Crucible Maker.

The making of crucibles is based on a well-defined theory, and the crucible-making plant should be under the sharpest supervision of its manager and his trained assistants. They must be possessed of the latest knowledge of metals and their alloys, of furnaces, of fuels, of fluxes, and of the mechanics and the chemistry applied by the people who use their crucibles. A successful crucible maker must make constant chemical analyses of his materials, and he cannot have too much knowledge of the broad lines practiced by his customers. The fusion point of different metals is vastly dissimilar. This must be taken seriously into account. For instance, the crucible made for steel melting is useless in a brass foundry. It is far more refractory, it is true, but if the brass melter employed a crucible intended for steel melting, it would slowly wither away in his lower temperature, where it would behave beautifully in a furnace with heat 1,000 degrees Fahrenheit higher.

Intimate knowledge of fuels and their function is also absolutely necessary to the crucible maker. He must know not only the behavior of the several fuels, as coal, coke, gas, and perhaps electricity, but also the quality of these several fuels, as not only a change from coal to oil, but a simpler change of from one coal to another, has an intimate bearing on the life of a crucible. Then, what suits one melter does not seem the best for another working under apparently like circumstances. To illustrate: A customer of the Jos. Dixon Crucible Co. once complained of poor results in his large foundry, and insisted the fault was in the crucibles. We were convinced that it was not, as his results were uniformly poor, so we proposed to him that we take from the same batch, and the same kiln-burning, 200 crucibles of the size he used; divide them into two shipments of 100 each, he to receive one shipment, we to send the other 100 to a shop of like renown, and doing similar work, and exchange results. This was carried out to the letter. Four weeks later, when both sets of 100 were used up, reports showed that in the other foundry the average was $42\frac{64}{100}$ heats, but in his foundry the best run was 18 heats, while the average was between 14 and 15 heats. This seemed to be knock-down proof that the crucibles were not only all right, but that his practice was either bad, or his fuel unsuitable, or the crucibles not adapted to his work.

Again, the crucible maker should know the nature of the fluxes used, and try to be informed of the crucible user's preference in fluxes. These fluxes chiefly attack the binding materials in the walls of the melting pot. To some fluxes these binding materials are impervious, to other they are an easy prey. To illustrate again: It is an everyday occurrence in our office to get letters inquiring what we know as to the effect of this or that substance on the walls of the crucible, and last week a metallurgist called, and after telling his wants in the way of a special crucible, and listening to our explanation of what we could do, paused a moment in thought, and then said: "Well, shall I change my flux, or will you change your crucible?"

Again, by slow and almost unperceived steps a very large use of the more fusible alloys has come, and come to stay. The market demands denser and stronger castings, and for this the fusion must be much more fluid. Hence the rapidly increasing use of phosphorus, aluminum and manganese. The use of these alloys not only adds strength and density to the castings, but promotes the fusion and increases the fluidity. This raises the question of the porosity or permeability of the wall of the pot. If the crucible with these extra fluid fusions is not well chosen, or should it contain hair-line cracks, invisible to the naked eye, this very fluid mass will find such cracks and prepare the way for a leak. While we are convened here, the British Iron and Steel Institute are in session in London, and the topic of one of their papers is "The Permeability of the Wall of the Crucible." In brief, the day has passed when a crucible is simply a crucible, or when one kind will suit all fusions, all fluids, all fluxes, and all furnaces, or, to change the putting of it, there are graphite crucibles and graphite crucibles. It is not sufficient that the mixture carries graphite; the crucible must be specially adapted to its particular service.

*Read at the Convention of the American Foundrymen's Association, Detroit, May 10, 1897.

Care of Crucibles.

So much for crucibles and crucible making. We must now turn to the other half of my subject, viz.: "How they should be cared for," by which is undoubtedly meant how the user should use them.

First, let me emphasize and iterate and reiterate that the value and life of a graphite crucible depend as much on the treatment it receives as on its own intrinsic quality. Last month we sent a special crucible to a New York brass founder for trial to verify a new purchase of graphite. In due time the worn-out shell came back, with a note saying the crucible lasted 42 heats, but the customer added, "You must not expect this good result in regular work, as I supervised the trial of this pot myself," thus unconsciously emphasizing the difference between his handling and other handling.

Annealing.

In using a graphite crucible the first step is the annealing. When the crucible comes from the maker's kiln, where the temperature is very high, it is supposably "bone-dry." It is, however, a porous vessel, and it easily absorbs moisture, hence it should always be stored in a "bone-dry" place. I have seen crucibles stored in a shed where both rain and snow came through cracks and broken windows, and the crucible maker, hundreds of miles away, was "called down," later on, because the pots "scalped." As to annealing, both too little stress, and too much stress, can be laid to it. The best annealing is even heating. That is, evenly warm the pot, not on one side only but around the pot, to a temperature say between 250 degrees F. and 300 degrees F., and maintain that heat there until all moisture is expelled. Nothing more is required, except equal good attention should be given to the even cooling all around the pot.

Four weeks ago a customer repeated his order and said, "Please send better pots next time." Some of the previous lot, he added, "broke on annealing." How a crucible can break in the preliminaries of a proper annealing is, as yet, an unsolved problem. In this case we went to the stock and found in the rear of the pile one of the same batch as those that he complained broke on annealing. We took it to the boiler room, where the fire was in fine shape, and without a moment's preparation or delay, threw the crucible on its side on the coal, where the heat was a bright cherry red. The pot stayed there some 25 minutes with boiler doors closed, until it was red hot. We withdrew it from the fire and immersed it in a bucket of cold water and let it cool until it could be touched, returned it to the fire the other side down, brought it the second time to a red heat and gave it a second cold-water bath, and when it was once more cool enough to handle, it rang like a bell, and one could not see that anything had happened to it. This was from the same batch as the others that were reported broken in annealing. By a batch, I mean that for convenient handling a given quantity of the crucible mixture is prepared at one time. This given quantity is called a batch. As we work by many different formulæ, each batch is numbered, a careful record kept of its ingredients, and further than this, every individual crucible is stamped with its batch number, so that is pedigree can be ascertained at all times. Our furnaceman asked us why we were treating the crucible in the manner that I have mentioned, and on being told that duplicates had broken in annealing, said, "I guess he annealed them with a sledge." The pith of annealing is that the crucible walls should be heated and cooled off evenly, and that it receive heat enough and no more than enough to expel its accidental moisture. An additional word is specially suggested, if the crucible is a large one: after toasting its outside walls, set it over a black, low, slow fire, bottom side up, so that the inside walls as well as the outside, can feel the good of the toasting process. Do not, for annealing purposes, set a crucible bottom down at an angle, say, of 30 degrees in the hole of a hot furnace. We had one returned, some months since, that had been treated that way. The flame marks on the bottom of the pot showed this, and we, the makers, were blamed, and asked to send a new one because it had "scalped." We would have been placing and replacing until this day if that practice had continued.

Other Particulars of Practice.

After annealing, the next thing is to get the glaze on the crucible as soon as possible, by as rapid first-firing as possible, consistent with the safety of the pot. The mixture of the crucible contains ingredients that at a sufficiently high heat ooze out in a vitreous and glass-like paste, which, after flowing down the sides of the crucible, sets, covering the crucible with a protective coat. You must also remember that the graphite in the crucible is carbon, and free oxygen will, if permitted, unite with the carbon and take it away. When this takes place the graphite has disappeared, and it looks like a clay vessel. The melter then complains to the crucible maker, saying, "The melting pots are not as usual; they have no graphite in them, and look like a clay pot." Then again, take any crucible and the microscope will reveal over its surface, invisible to the eye, fine hair cracks. All this the glaze will take care of. Once the crucible has this protective glaze, the oxygen is powerless to disturb the graphite, and the invisible hair cracks are sealed.

The furnace draughts and dampers should be so regulated as to produce a reducing flame instead of an oxydizing flame, the latter being, as before explained, always unfriendly to a graphite crucible. By a reducing flame we mean one where the dampers admit just enough air to burn the gases, and by an oxydizing flame is meant one with surplus air, which promptly goes for its affinity, and in the crucible it instantly finds its affinity in the graphite.

A third hint concerns the fit of the tongs. In a fire hot enough for brass or copper fusion, the crucible becomes soft and pliable. In lifting it to pour, if the tongs do not fit or are not made to grip the crucible at the right place, you may, in the struggle to sustain the expensive charge, bend the pot too much, and it cracks. The proper way is to grip the crucible just below the bilge, so it will not need such a tight squeeze. Some melters use tongs shaped like the ace of spades; they grip better and remove the coal much more easily, thus preventing clinkers attaching to the pot.

Never allow any metal to cool in the crucible, but pour until the melting pot is entirely empty. In the parlance of the shop, don't leave the crucible so you will find a "button" in the bottom when it is cooled off. In cooling, each button will have small threads or spikes of metal which will attach themselves to the soft crucible walls and become firmly fixed in them, and the walls of the pot are torn in getting them out.

After pouring the metal, don't roll the pot out of doors, where it will get rained upon, or place it on a bed of wet sand, where it will absorb moisture. If you do, you put it exactly where, in its hot, soft condition, it will become spoiled either totally or partially. In lifting large pots by the crane, don't release the grip and let them drop four or five feet on a stone floor; rather hold the grip until within two or three inches from the ground, and then drop them if possible on a bed of old dry sand. In filling the pot, don't pack ingots or scrap too tightly. Expansion and contraction go on in the heating and the cooling, and a little gumption is necessary to prevent the pot from being strained or cracked.

In ordering your crucibles, give the maker a hint, first as to your fuel—whether coal, coke, gas or oil; then as to the metal you melt; also, if possible, your average time of heat. He can then send a pot better adapted to your special work. In the old times a crucible was made only by one formula, but now the Dixon company make crucibles by 20 different formulæ, or "mixtures," as we call them, and produce coal-fire pots, coke-fire pots, oil-fire pots, and gas-fire pots, and different crucibles for melting steel, brass, nickel, phosphor-bronze, or other metals.

A certain customer of ours noticed that he used up an invoice of pots in about half the usual time. He thought of his flux and sent us a small sample. We sent him another crucible, making it by another formula, which overcame the difficulty. It was simply a case of better adaptation after we knew the nature of the flux.

Causes of Poor Results.

For causes of failure, or unreasonably short life, in a crucible we may mention:

First. The wrong kind for service; either a pot unsuited to the furnace, to the metals, or to the fuels. Every up-to-date shop is now equipped with fierce drafts, taller stacks, corrosive fluxes, so that the old time two and one-half to three hours' heat has dropped to one and one-half and one and three-quarter hours. Don't expect the crucibles to stand

this extraordinary strain unless you are equipped with a crucible made with a knowledge of the special situation.

Second. The life is shortened by rough handling, a great deal of which is unavoidable. The melter's job is a hard one; he works always in an atmosphere of excessive heat; his eyes are invariably in distress; he lifts heavy weights of seething molten metal; he literally earns his bread not only by the sweat of his brow, but of his whole body; his work taxes his every nerve and every muscle. Not much wonder then that now and then the tongs squeeze a pot to a crack, or he flinches from the sometimes extra care necessary.

Third. The life is shortened by corrosive fluxes. These fluxes are introduced to promote fusion and give clean slags. The crucible maker does not know what the melter will use. The melter does not always know the destructive influence of his flux on the walls of his particular melting pot.

I must ask great respect for the graphite crucible. There are not many men and not many things in this world for which there are not substitutes, but for the graphite crucible there is no known substitute. It is a fragile thing, and you ask it to do and stand what nothing else in this wide world can do or can stand.

THE FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Foundrymen's Association was held at the Manufacturers' Club, Philadelphia, on Wednesday evening, June 2, with President Wanner in the chair. Secretary Evans read the report of the executive committee, as follows: "The executive committee have very little to say on the subject of the foundry trade. We have made so many prognostications and have failed so utterly that the less we can say probably the better. In January we made a statement that by the first of June the shops would be full of work. The first of June has arrived on schedule time, but we do not find the shops full of work, as a rule. There are some few foundries that are busy on specialties, and some have sufficient export trade to keep their cupolas running to their capacity, but the foundry that has to go into the market and pick up trade has a hard row to hoe and it finds but little work and at very low figures, which is, to say the least, exceedingly unsatisfactory. However, we are now impressed with the idea that the worst is over and that there is a gradual change for the better. The large convention which is being held in this city during this week by the Manufacturers' Club and the Philadelphia Museum may have an important effect upon trade in general, particularly trade with South and Central America and Mexico and other foreign countries. This will be one of the greatest conventions that has met in Philadelphia for years, looking entirely to the interest of the manufacturer and to the improvement of our export trade. The National Association of Manufacturers, under the presidency of Mr. Search, is about opening a permanent exhibition in Venezuela, where samples of American manufactures will be placed under the care of attendants who will look after the interest of the exhibitor. Thus all lines are being looked after with a view to building up business out of the depressed condition of affairs that we have had during the last several years. We cannot help but think that the time is not far distant when we will find ourselves again in prosperous condition."

The treasurer reported $1,508.61 in bank to the association's credit.

Mr. Evans then called upon the various members present for expressions of opinion on the business outlook.

Mr. Fitch, of Hanover, Pa., said that his firm was busy, but that trade was dropping off again.

Mr. Oliphant, of the Trenton Malleable Iron Co., said: "Business is about the same as it was last month, and not so good as during February and March. It is better, however, than during the corresponding period of last year. Prices are a little lower than usual, but the promises of trade during the next three months, I think, will be realized."

Mr. Ellicott, Southwark Foundry & Machine Co.: "We are still in a very flourishing condition—better than at any time during the eight or nine months past. The volume of business is increased. We are still working on the order for Russia, which I reported to you several meetings ago, and we are working hard to get the job done on time."

George Rocket, Morris, Tasker & Co., Philadelphia: "Business is very dull and has been so for the last month."

Mr. Harkins, of T. B. Harkins Foundry Co., Bristol, Pa.: "Not much improvement in our neighborhood."

Mr. Williams, of Enterprise Mfg. Co., Philadelphia: "We have been working five days a week, but we have hopes of doing better than that. The general trade has advanced during the last month. We have increased our foundry force, and prices are good, only because we have a standard price for our specialties, and will not go below it."

Mr. McClure, Hooks Smelting Co., Philadelphia: "We expect more business soon. Orders are coming in slowly. As the iron men pick up, we will find improved conditions in our brass foundry."

President Wanner, representing the cast-iron pipe section, said: "I still feel as I felt at the last meeting in regard to the effect of tariff agitation upon trade conditions. If we are to have a July meeting I think it should be devoted to the consideration of this evil, which is holding back prosperity. The pipe trade, so far as I can see, is still in a deplorable condition. It is exceedingly annoying to me to see, whenever there is a little bit of a letting, nearly all the pipe founders from all over the country competing. In many cases I refuse to bid just to show that somebody has the backbone to stand back and let the others do the scrambling. If this keeps up, it will show that there are a great many more pipe foundries in the country than are needed. That, however, I cannot believe. A general revival will boom the pipe trade, fair prices will be realized, and there will be enough to keep all busy. Prices should have been kept up all along instead of resorting to cutting. It was possible, for they never got so low as this, even during the crisis of 1888. We want more pluck and courage. I hope that when we meet again, the tariff question will have been disposed of, and we will have prosperity."

Mr. Evans announced that the American Foundrymen's Association was in debt on account of the convention at Detroit, and was in need of help. He suggested that $50 be contributed by the Philadelphia association to help liquidate the indebtedness. The suggestion was well received, and a check for the amount was ordered to be forwarded.

A short paper by Mr. S. S. Knight, chemist of the Addystone Pipe & Steel Co., Cincinnati, was then read. It is as follows:

Fletcher's Process of Making Cast-Iron Pipe.

The cast-iron foundry business, and particularly that part which has to do with pipe making, seems to have remained almost dormant for the past 20 years. By this statement is meant, not that all of the details of the pipe foundry business have been retained unchanged in all that period, but that no material or striking advance has been made since the vertical casting of pipe was inaugurated. How far reaching the benefits of this method were we should not forget, but although it greatly lessened the chance of loss from such defects as one-sidedness or lack of symmetry, it did not materially decrease the cost of production.

It should be remembered that in pipe making one of the greatest costs aside from the metal is the mold and the labor necessary to clean and render marketable the product. In the molding the chief cost is the making of the core and the maintaining of the barrel or core bar in working shape, especially for smaller pipe such as 3, 4 and 6-inch. In the cost of the core we will first consider the materials used in its manufacture. By far the most costly of these is the hay rope, or loose hay, that is put on as the combustible layer. This is then covered with clay, and this in turn with the so-called first coat usually made of clay and dirt taken from the previous cores. The bar or barrel with this cover is now dried. It is then taken out and upon it is turned the last finish coating of sand, sawdust, and previously used core dirt, after which it is given a coat of blacking. The finished core is now dried. This core when used burns and vents well, but leaves the core dirt stuck fast to the interior of the pipe. Since so much clay is used in making the core, the dirt has to be in a large measure cut out and much labor is required to clean a pipe so made. The necessity of the pipe being clean and free from adhering dirt will be apparent when it is noted that a coating of tar paint has yet to be applied. The two objections to this process will be noted, viz., the cost of the hay rope, which, on a 6-inch bar amounts to over five cents, and the labor required to clean pipe cast with such cores, due to the amount of clay used in their manufacture.

Among the recent improvements that have come forward in the pipe foundry business, none seems more deserving of consideration and use than that proposed by Dr. Fletcher, of Cincinnati, for making the cores just described. His invention was the result of patient labor extending over seven years, and although he met with pronounced successes, he did not stop until he had given to the trade a method simple, economical, and which masters both of the difficulties pointed out in the use of the old method.

Early in the nineties Dr. Fletcher began experimenting with a view of doing away with the hay rope used. To accomplish this, mixtures of combustible substances such as sawdust, leaves, etc., and earthy or mineral cements were made. The proportions were varied in every reasonable way with more or less success. But not until more recently did he conceive of his present method, which at this time stands perfected in every detail. The method consists in mixing starch hydrated in water with sawdust, or any comminuted combustible material, and applying this to the bar or barrel directly by means of a wire gauze which passes under the bar and off, from one roll on to another, the two rolls being geared to the bar. A two per cent solution of starch is used and in practice this is mixed with an equal bulk of sawdust. About 25 per cent of this starch solution is saved by being squeezed out by the gauze and collected, and is again ready for use.

After the bar is covered with the sawdust mixture it is placed in the oven and dried, when it is ready for the first and only coat of dirt. This dirt is the same in composition as the last coating in the old process, and since it contains no clay it can be easily washed out of the pipe.

The cost of applying this process on a 6-inch bar is less than one cent, or a saving of four cents on the combustible coating on a single bar. In this new process only one-half of the dirt usually used is required and the saving in labor in the cleaning shed amounts to fully one-half. But a virtue of no small importance is the increased size of the bars used on all small pipe, since this coating may be put on any thickness desired. This increased size of the bars allows them to withstand rougher usage and materially prolong their life. Since no clay is used in the dirt core, the core is very porous and vents well. The gases forming near the molten iron escape back through the core, and thus the danger of blow holes in the iron is reduced to a minimum.

There was no discussion of the paper, and Mr. J. H. Pepper, of the *Iron Age*, gave an interesting account of the Philadelphia delegation's trip to Detroit and of the work of the National convention.

Mr. Davis, of Thomas Devlin & Co., made a few explanations of certain points in his paper read at the May meeting.

Mr. Evans told of a conversation which he had at the Detroit convention with Thos. Doherty, of Sarnia, Ont., relative to a patent which Mr. Doherty has on a process in metal founding. The process involves the injection of dry steam into the cupola in conjunction with the blast. A 2½-inch pipe is carried from a steam main to the cupola. Underneath the blast belt of the cupola is bent a pipe one inch in diameter having T-pieces opposite each tuyere, from which branches of ¼-inch diameter are led into the tuyeres, each branch having a wheel valve to regulate the steam introduced. It is claimed that by this process all kinds of scrap could be utilized, and that the hard irons of certain kinds of scrap were softened. With more perfect combustion it was claimed there was better liquefaction and that the resulting iron was more homogeneous. After his talk with Mr. Doherty, Mr. Evans said he mentioned the matter to Mr. A. L. Carlton, of the Pratt & Whitney Co.'s foundry. Mr. Carlton said that the idea was not new, and that he had used steam in this way years ago.

Mr. Williams: "The idea certainly is old. My first employer used it successfully at the Hazelton Locomotive Works many years ago. I have tried it, but could never be sure of getting dry steam, which is absolutely necessary to success. Besides, I don't believe any scrap that is burnt out, or even partially burnt, can be made into good iron."

The meeting then adjourned.

THE East End Brass Foundry Co., Cleveland, has increased its capital stock from $5,000 to $10,000.

AN EXPOSITION AT CHICAGO.

An exposition of the products of Illinois will be held in Chicago during September and October, in the Coliseum, which is the largest amusement and exhibition building in the world, and especially adapted for exposition purposes. The enterprise will be under the management of the Chicago Exhibition Co., which controls the Coliseum. The exposition is called the Illinois Manufacturers' Exposition of Home Products, and the prospectus recently issued contains the following: "It is believed that an exposition of purely Illinois manufactures and products will result in great good. There has never been an exposition of this exclusive character held in Illinois, and the great variety and superior quality of a full and complete display of the articles manufactured and produced in the State will be one of gratifying surprise to the people. A special feature will be in making one of the departments a vast factory wherein the public can witness the process of manufacture of almost every articl eexhibited. It is intended to make the fine arts display an exceptionally fine one, consisting of paintings in oils and water colors, engravings and etchings, black and white, pen and ink, and other drawings and sculpture."

Factories are in operation in Illinois which make nearly everything needed to wear and eat, and most of the articles in common use. An exposition of the nature planned will undoubtedly be of great benefit to the manufacturers, and will give the general public an opportunity to find out what a really great manufacturing State Illinois is. It is hardly appreciated that this State ranks second of the United States in manufactured products. The classification of exhibits embraces fine arts, applied arts, textiles, furniture, machinery, foods, general industry, lighting and heating and transportation. The exposition will be open from Sept. 2 to Oct. 16.

Alabama Experience with Multiple Tuyeres.

Several furnaces in the Birmingham district have done something in the direction of the efforts at Duquesne, to increase output by furnishing greater volumes of air. The correspondent of the *Iron Age* makes this comment: "Too much credence should not be given to the wild reports sent out as to the 'marvelous results' from the multiplication of the tuyeres in the furnaces. In the first place they are not in general use; in the next place they are only in the experimental stage. At first the results in particular instances were very encouraging. But these results have not been continuously favorable. The question being investigated is: 'Were these results illusory, or is there fault in our management!' In one instance a doubling of the tuyeres produced no increase whatever. In other instances the initial results gradually diminished from the top notch, and it is this eccentricity of the method that is the puzzle to be solved. On its satisfactory solution depends the utility and consequently the general use of the method."

AT Pittsburg the Columbiana National Bank and Mathias Weiss filed a bill in equity against the Westmoreland Fire Brick Co., W. B. Wolfe, A. H. Leitch and others, asking that the sheriff be restrained from selling the personal property of the company on a $7,218.01 judgment note, and that a receiver be appointed. It is said the judgment note was given by the defendants to save themselves. The company owns 243 acres of land at Hunker station, Westmoreland County, with an $80,000 plant erected thereon. It also has $50,000 worth of personal property. Lately, plaintiffs say, the company has defaulted on wages. Plaintiff Weiss is an endorser on a $12,000 note, and the bank holds a protested note for $2,641.

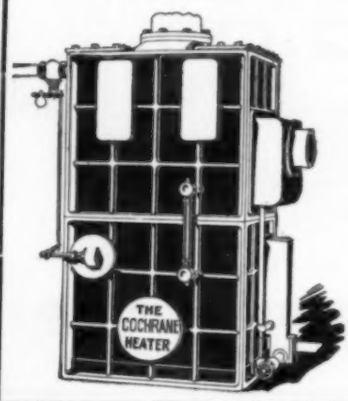
ORDERS have been issued for the Pennsylvania Railroad machine shops at Altoona, Pa., to work 50 hours a week and the Juniata shops 45 hours, commencing to-morrow. Orders for 10 new class "P" passenger locomotives were placed with the machine shop to-day, and five were placed on order at the Juniata shops.

THE copartnership between Horace See and W. H. Jaques has been dissolved, and the offices at 1 Broadway, New York City, will be occupied by Horace See as consulting engineer.

COCHRANE HEATERS.

Harrison Safety Boiler Works,

PHILADELPHIA, PA. MFRS.



No! Any old thing won't do when it comes to heaters. There's a difference in heaters as well as in shoes—a difference in the kind and quality of the material used—in the "trimmings"—in the workmanship—in the **wear**—in the satisfaction given. In the case of a shoe, you can "Put your foot in it." So you can with heaters if you do not get the right kind.

We are continually inviting comparisons—our **"COCHRANES"** against the field. How is it we sell so many of these Cochranes? Price? Well! Not exactly; our prices are particularly reasonable considering all that we furnish—but we don't bother much about what the other fellows are asking. We leave it to the buyer—first giving him a clear, accurate statement of what we are going to furnish, and of what that appliance will do.

We believe in putting the facts in cold type, so that they can be read and digested. Some of these cold facts, with illustrations, can be had for the asking.

===ANY OLD THING.===

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Fort Pitt Machine Co., of Pittsburg, has been organized and a charter will be asked for. The parties interested are Joseph G. Siebeneck, Joseph Ludwig, Thomas H. Hughes, Thomas R. Hartley, and H. K. Siebeneck.

The new boiler works project for Niles, O., already noticed in these columns, is likely to be carried through successfully. J. H. Orwig is to be manager of the new concern, F. E. Pendleburry, superintendent, and E. A. Gilbert, engineer. All were connected with the Reeves Bros. Co.'s boiler works at Alliance. The old Chauncey Andrews property at Niles will probably be the site. Machinery has been purchased, but the building contract has not yet been let.

The Wheatland Rolling Mill Co., Cheyenne, Wyo., has been incorporated, with a capital stock of $50,000, by Joseph M. Carey, Louis Kirk and J. B. Boyer.

The Holmes Metallic Packing Co., of Wilkes-Barre, Pa., has been organized to manufacture the Holmes metallic packing, which has been sold for the last four years by Thos. N. Holmes The president is W. L. Cormell, of Scranton; vice-president, Cyrus Straw; treasurer and secretary, Wm. Sharp; T. H. Holmes, general manager, all of Wilkes-Barre.

The Spring Heel Horseshoe Co., Cleveland, has been incorporated with $50,000 capital stock by Robert Powell, Thomas Fleming, Frank S. Krause and Morton W. Cope.

The Philadelphia Roll & Machine Co., Philadelphia, has been incorporated with capital of $200,000, commencing with $20,000, to manufacture and deal in iron and steel. William Selfridge is treasurer.

New Construction:—

Press dispatches state that the new coke plant which has been projected at Youngwood, Pa., will be pushed to completion at once. Present plans call for 150 coke ovens. The company owns 136 acres in the vicinity, and tenement houses will also be erected. A seven-mile branch is now constructed from the Pennsylvania R. R. to Youngwood.

The Queen Construction Co. is erecting in Flushing, L. I., N. Y., a new electric light plant. The building is divided into two portions—a boiler house 40 x 42 feet and an engine and dynamo room 43 x 71 feet. The walls are of brick, with stone foundations, and the roof is of iron, covered with metal covering. The building will be fire proof. The roof of the engine and dynamo room is lined with the Berlin Iron Bridge Co.'s anti-condensation roof lining. The Berlin company has the contract for furnishing and erecting the steel framework and the covering.

The Oliver & Snyder Steel Co. has decided to rebuild entirely the stack of the Rosena furnace, at New Castle, recently damaged by explosion, and the old stack is already being torn down. The new furnace will be capable of a larger production of iron than any in the country excepting the Carnegie furnaces. The old stack was 80 feet in height, with an 18-foot bosh, and had a daily capacity of about 300 tons. The new stack will be 100 feet in height, and will have a 24-foot bosh. It will have a capacity of 500 tons of iron a day, or over.

Contracts have been let for rebuilding the Warren, O., boiler works, destroyed by fire last week.

A new industrial town, called Dispatch, has been begun by the Merchants' Dispatch Co., near Rochester, N. Y., and shops are now in process of completion. J. W. Musson, Gen. Supt. Car Dept., Rochester, is in charge of much of the work.

At Cincinnati the Edison Electric Light Co. is to build a new power station, work to be commenced by July 1.

Reports state that a local company will construct an electric light plant at Sanborn, Ia., and that estimates and preliminary surveys are now being made.

Hamilton & Co., Pittsburg, have closed a deal to erect a tin plate plant at West Newton, Pa., 34 miles from Pittsburg. Ten acres of land and a bonus of $10,000 were given. The head of the enterprise, John Hamilton, of Pittsburg, has been making roofing plates at Hazelwood, near Pittsburg, for some years. The dipping plant will be removed to West Newton, so as to be combined with the black plate mill. The present price of tin plates makes it unprofitable to buy black plates in the market.

Additions, Enlargements, Removals, Etc.:—

Borger Bros., of Columbus, O., manufacturers of boilers, plate work, blast furnace work, etc., are about to lengthen their main building 36 feet and add new equipment.

Stanley G. Flagg & Co. are erecting an addition to their iron and brass foundry at Pottstown, Pa. The building will be of brick, 50 x 56 feet, and used for galvanizing purposes.

Fires and Accidents:—

A train of Modoc cars containing molten cinder from the Edgar Thomson furnaces was derailed last week at the point where the track crosses the P. McK. & Y. Ry. The molten cinder fell into a coal train standing beneath and started a fire that destroyed several cars.

The hopper and bell center of Furnace H, of the Edgar Thomson Steel Works, blew up last week and molten metal was scattered for a distance of several hundred feet. No one was hurt. This is the same furnace which blew up two years ago.

General Industrial Notes:—

James Bonar & Co., Carnegie Buliding, Pittsburg, have been made general sales agents of the Pittsburg feed water heater, of which J. E. Schlieper is patentee.

The Lockhart Iron & Steel Co. has started its McKee's Rocks plant. The choice of accepting the $4 puddling rate or remaining idle was given the puddlers, with the above result.

The La Belle Steel Co., of Wheeling, announces that there will be no summer shut down at their plant.

The Altoona rolling mill, whose employes recently struck,

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁜ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

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DUCTILE CAST IRON

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HOMOGENEOUS, SOLID AND CLEAN.

HIGH ELECTRICAL PERMEABILITY.

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Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Billet Heating Furnaces. Plans and estimates furnished.

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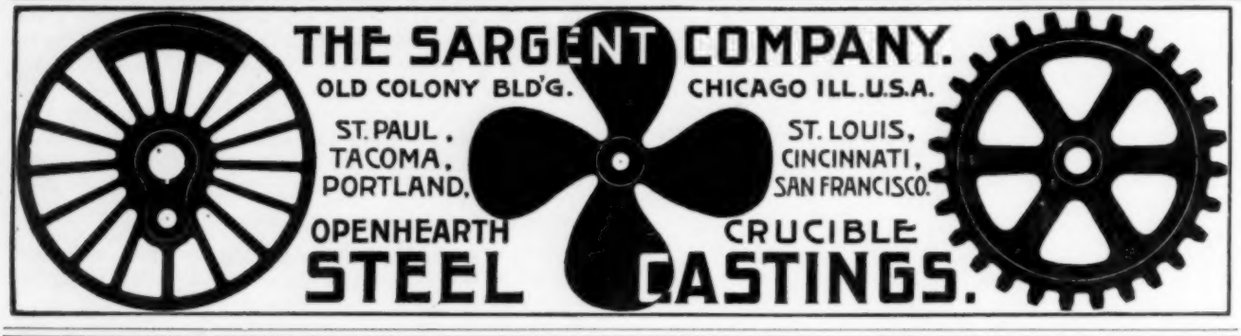


announces that it will remain closed indefinitely. About 130 men are affected.

The property and franchises of the McKeesport Illuminating Gas Co. have been transferred to the United Coke & Chemical Co., of Glassport, for $100,000. Gas will be furnished from the by-product coke ovens of the company and the price reduced from $1.25 to 75c.

The Aschman Steel Casting Co., Sharon, Pa., manufacturer of open-hearth steel castings, has completed repairs and started its plant in full with sufficient orders ahead to keep it fully employed for the next two months.

Deitz, Schumacher & Boye, Cincinnati, O., note that the domestic demand for iron working machinery has increased materially in the past month, compelling them to increase their working force by 20 men. The foreign demand continues to hold its own. A number of good orders have been secured from various parts of the United States. One lot is now on its way to Sultenango, Mexico.

The Michigan Foundry Co., of Battle Creek, Mich., has sold its plant to the Advance Thresher Co. and has gone out of business.

The striking molders of the Vulcan Iron Co. at New Castle returned to work last Thursday at the old price of $2.50. A reduction of 35 cents was threatened and brought on the strike. The settlement includes concessions on the part of the men in methods of working which were fully satisfactory to the company.

A party of officials of the Carnegie Steel Co. and of the Pittsburg, Bessemer & Lake Erie Railroad has inspected the new steel ore cars at the Schoen Pressed Steel Co.'s works at Allegheny, Pa. Two cars of the Schoen pattern, with 50-tons capacity, have been shipped to Old Point Comfort, Va., to the Master Car Builders' Convention. The Schoen company will now turn out 8 to 10 cars a day on the 600-car order.

Of the 101,041 tons of Southern iron shipped in April, 29,996 tons went to the East, 38,207 tons went to the West and 32,838 tons went abroad. Of the cast iron shipped 2,424 tons went East, 2,900 to the West and 336 went abroad. The Birmingham district shipped 78,348 tons of pig iron and 1,960 tons of cast-iron pipe.

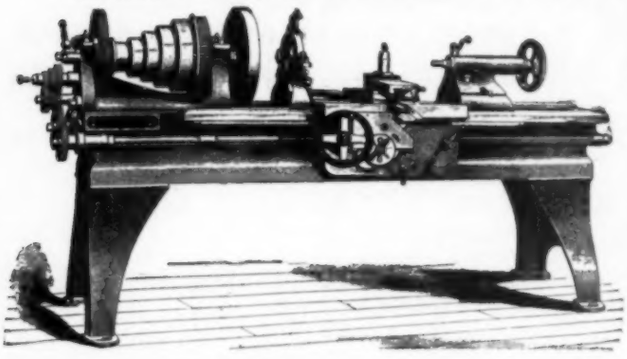
Laborers at the Sharon Iron Works, Aschman steel casting plant and the Buhl steel plant, at Sharon, have been reduced 10 per cent.

The new puddling rate at the Altoona Iron Co.'s mills is $2.50, a reducton of 25 cents.

Chicago agricultural implement manufacturers report an improvement over last year's business. The McCormick works are busier than at this time last year, some depart-

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.



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Send for List of Second-Hand Tools.

THE SUPERIOR CHARCOAL IRON CO.,

Exclusive Sellers of the Following Well Known Brands of

LAKE SUPERIOR CHARCOAL PIG IRON,

Antrim, Elk Rapids, Gaylord, Hinkle,
Peninsular, Pioneer, Spring Lake, Union.

All business connected with the sale of the above brands of Charcoal Pig Iron will, from April 1st, 1897, be handled by THE SUPERIOR CHARCOAL IRON CO., of Detroit, Mich., which is thus enabled to supply the best iron known for all purposes, especially for Car Wheels, Malleable Castings, Boiler Tubes, Ship and Armor Plate, strong high Silicon for foundry purposes, Basic Pig Iron with the minimum of Silicon and Sulphur, also iron to take the place of Salisbury, Southern, and Swedish Charcoal Iron.

OFFICERS { WM. G. MATHER, Prest. / W. H. HINKLE, Vice Prest. } F. B. GAYLORD, Secy. & Treas. } J. C. HOLT, / WM. GERHAUSER, } Sales Managers.

Office, 66 Newberry Bldg., DETROIT, MICH.

ments being in operation overtime. They never made as many machines in one month as in the past 30 days.

The receivers of the Baltimore & Ohio Railroad will apply to the United States Court for authority to issue $680,000 additional receivers' certificates, to bear interest at five per cent. They will be a lien prior to mortgage and also to the $5,000,000 six per cent receivers' certificates issued June 1, 1896. The obligations will be turned over to the Carnegie Steel Co. in payment for 40,000 tons of steel rails at $17 a ton. It is said that the Carnegie company has already negotiated the sale of the certificates. The issue will be vigorously opposed by the bondholders, and the indications are that a stubborn fight will begin in the courts when the receivers file their application.

The Wellman-Seaver Engineering Co., of Cleveland, has shipped two of the Wellman electric charging machines, of 1897 type, to the Llanelly Steel Works, Llanelly, Wales. It is to be expected that further orders will come from the United Kingdom, in view of the greater disposition of steel masters on the other side to bring their equipment up to the American standard of efficiency.

The employes of the Vulcan Foundry, New Castle, have struck against a reduction of wages from $2.50 to $2.25 per day.

The Government has just placed a large order for lathes, sharpers, drill presses, etc., to be used on the United States dredge boats in the Mississippi river.

The R. D. Nuttall Co., of Allegheny, Pa., reports a gratifying demand on its gear-cutting facilities. Bevel, mitre, spur, worm gearing, racks and sectors passing through the company's shops at present indicating the wide diversity of demands it is constantly receiving. Among many recent orders is one for heavy duty gears for rolling mill work, intended for Southern Russia. The company is also receiving large orders for special gears for running in hot metal.

W. S. Rockwell & Co., New York, report continued success with their new oil welding furnace. They have just completed several for the Bloomsburg Car Mfg. Co., Bloomsburg, Pa., for welding 3-inch and 3½-inch car axles. The work is done in much less time and far better than with coal. These furnaces carry the whitest heat, and give a perfect weld. Rockwell & Co. also report good orders for their double-end oil annealing furnaces.

Application for the appointment of a receiver for the King Ax Co., Cleveland, has been made by a stockholder. The petition avers that it is a Cleveland corporation, with a capital stock of $100,000; that the company is insolvent and unable to pay its obligations; that the factory has not been in operation for months, and that the corporation owes the Wick Banking Co. $30,000, besides owing other debts. The real estate is said to have been transferred to E. H. Whitlock, a stockholder.

The Ingersoll-Sergeant Drill Co., Havemeyer Building, New York City, has been absorbed by an English company formed for that purpose, with a capital of $2,000,000. M. P. Grace, J. E. Dudly, R. W. Chapin and G. A. Phillips are the London directors, and W. R. Grace, John A. McCall and W. L. Saunders the American directors. The factory of the American company is at Easton, Pa.

After a continuous run of two years the Carbon Iron & Steel Co.'s furnace at Parryville, Pa., has been blown out. The work of relining the stack will be begun as soon as possible.

Uehling Steinbart & Co., Newark, N. J., have recently made sales of their pneumatic pyrometers to the West Bergen Steel Works, at Jersey City, for annealing furnaces, and to the Ultramarine Works of Newark, and an order has just been received from the National Tube Works for two instruments to be used in its tube-welding furnaces. The new recording gauge has been added to this instrument.

At the Reading (Pa.) Iron Works 400 men have struck because of a reduction in wages, puddlers being cut from $2.70 to $2.40.

The Carrie Furnace Co., Naylor & Co. and the People's Natural Gas Co., Pittsburg, have filed exceptions to the account of C. F. Wells, receiver of the Linden Steel Co. They claim he is not entitled to certain credits, aggregating over $5,000. They also claim he should be surcharged with $3,000 as the result of the sale of a lot of merchant steel sold below the market value.

EXCURSIONS TO PITTSBURGH

Via Pennsylvania Lines June 12th, 13th and 14th.

Low rate, account Jr. O. U. A. M. National Council, open to all. For details apply to nearest Pennsylvania Line Ticket Agent, or C. L. Kimball, Assistant General Passenger Agent, Cleveland.

To prolong the life of an old roof of tin, iron or steel, Allen's Anti-Rust japan has high recommendations. It costs little and lasts long. Address for particulars the Allen Anti-Rust Mfg. Co., 413 Vine street, Cincinnati.

An article combining a perfect lubricant and rust preventive, put up in convenient form, is furnished in Dixon's Graphitoleo. It is a preparation of choice graphite finely pulverized, and a pure petrolatum that does not gum or become rancid. It is put up in collapsible tubes.

Low Rates to Pittsburgh

June 12th, 13th and 14th via Pennsylvania Lines, account Jr. O. U. A. M. National Council. Excursion tickets sold to all applicants on dates mentioned. For particulars apply to C. L. Kimball, Assistant General Passenger Agent, Cleveland.

LOW RATES.

Via Pennsylvania Lines.

Special reductions in fare over the Pennsylvania Lines will be granted for numerous events to take place this summer in various parts of the United States, in addition to local excursions. Some of the points to which tickets will be sold and dates of sale are as follows:

To Nashville, Tenn., daily to October 15th, for Tennessee Centennial and International Exposition.

To Winona Assembly Grounds, Eagle Lake (near Warsaw, Ind.), May 15th to August 31st, for Annual Assembly and Summer School.

To Pittsburgh, June 12th, 13th and 14th, account National Council, Jr. O. U. A. M.

To Celeron (Chautauqua Lake), July 11th and 12th, account Photogra hers' Association of America.

To Toronto, Canada, July 13th, 14th and 15th, for Epworth League National Convention.

To Minnea olis, July 3d and 4th, for National Meeting, B. P. O. Elks.

To Chattanooga, July 13th, 14th and 15th, account Ba tist Young Peoples' Union of America.

To Detroit, July 12th and 13th for National Republican League Meeting.

To Cincinnati, July 21st and 22d, for German Epworth League Meeting.

To Indianapolis, August 17th and 18th, for Y. P. C. U. Annual Convention.

To Indianapolis, September 8th and 9th, for National Encampment Sons of Veterans.

The reduced rates over the Pennsylvania Lines will not be restricted to members of the organization mentioned, but may be taken advantage of by the public generally. Excursion tickets may be obtained at ticket offices on the Pennsylvania System and will be sold over this route by connecting railways. Any Pennsylvania Line Ticket or Passenger Agent will furnish desired information concerning rates, time of trains, return limit, and other details to all applicants, or the same may be obtained by addressing C. L. Kimball, Assistant General Passenger Agent, Clevealnd, O.

EXCURSIONS TO NASHVILLE.

Low Rates for Tennessee Centennial.

The Tennessee Centennial and International Exposition will be in progress at Nashville, Tenn., from May until October inclusive. Special low rate round trip tickets will be sold via Pennsylvania Lines for this event. Full particulars concerning fare, dates of sale, time of trains, etc., may be obtained upon application to nearest Pennsylvania Line Ticket Agent, or by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

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All of these tools are the latest improved and just as good as new, and can be seen at our ware-rooms on Second Street, Cincinnati.

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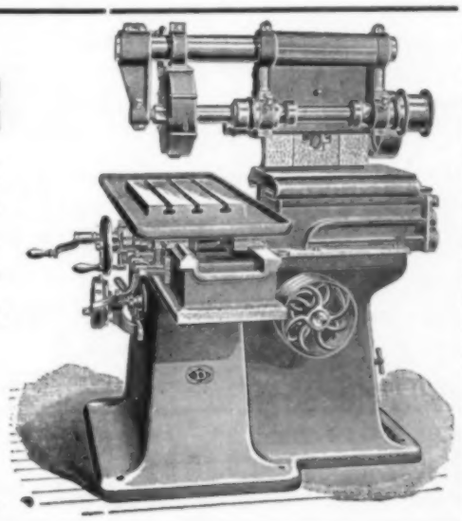
It is heavy and rigid. It will grind a true surface on a die or other flat work. Sales this week: one to England by cable, one to Ohio. Do you want one? We have them in stock.



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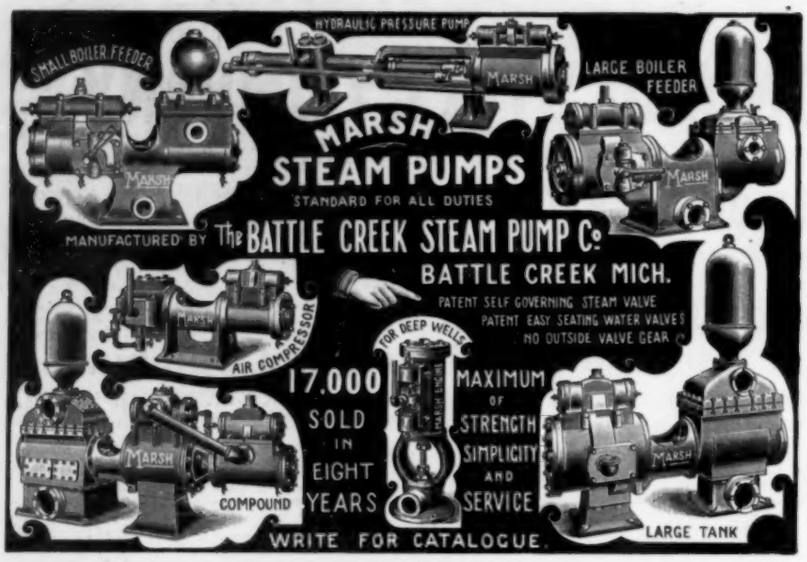

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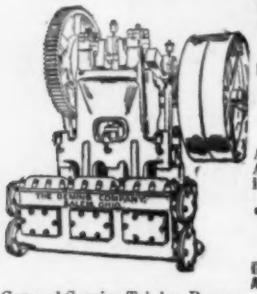

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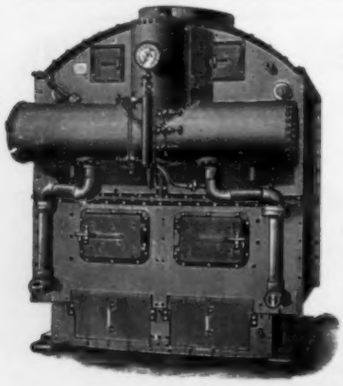

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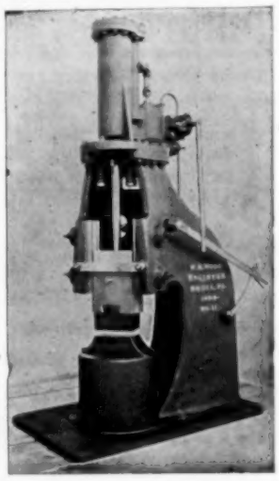

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* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:40 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

— Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
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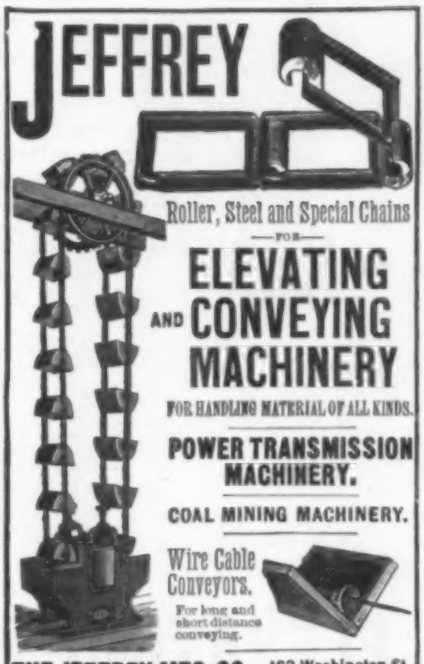

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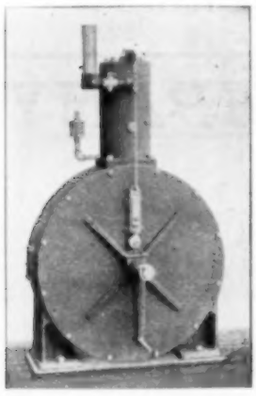

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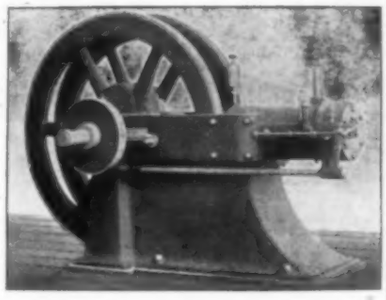

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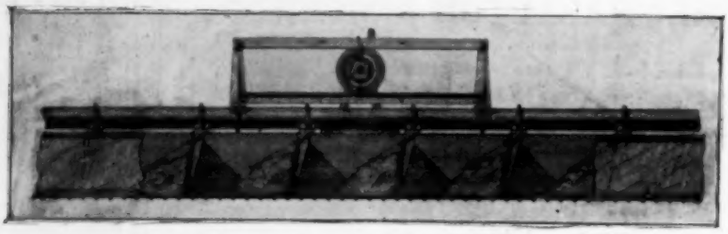

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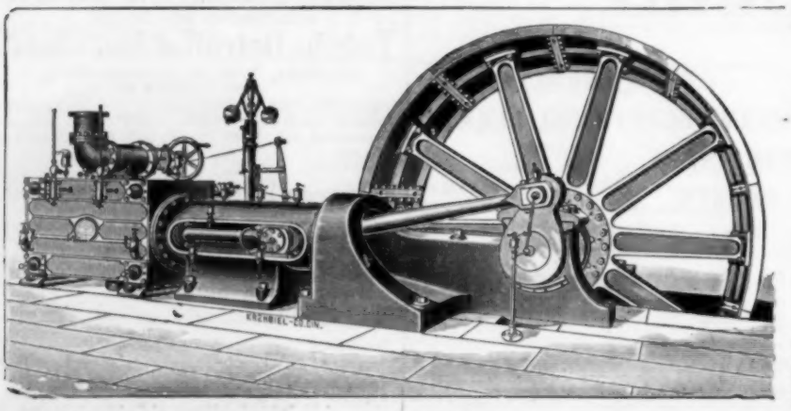

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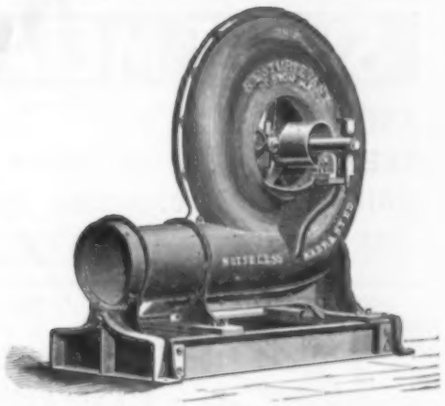

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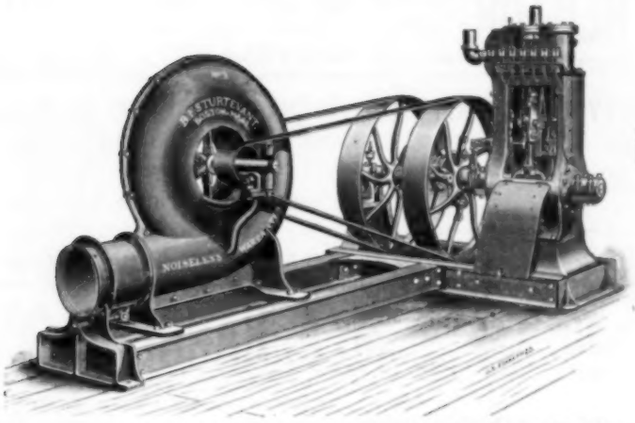

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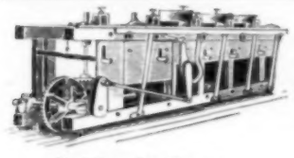

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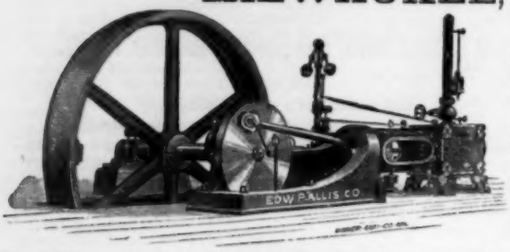

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Southern Coke No. 1	10 25@ 10 00
Southern Coke No. 2	9 75@ 10 00
Southern Coke No. 3	9 50@ 9 75
Southern No. 1 Soft	9 75@ 10 25
Southern No. 2 Soft	9 50@ 9 75
Southern Silveries	10 25@ 10 50
Jackson Co. Silveries	13 00@ 15 00
Ohio Silveries No. 1	13 00@ 15 00
Ohio Strong Softeners	12 00@ 12 25
Alabama Car Wheel	16 50@ 16 00
Malleable Bessemer	10 75@ 11 00
Coke Bessemer	11 50@ 12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 25@$ 9 50
Southern Coke No. 2 and No. 1 Soft	8 50@ 8 75
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@ 15 50
Tennessee Charcoal No 1	12 50@ 13 00
Jackson County Silvery No 1	12 50@ 13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	8 00
Standard Georgia Car Wheel	14 25@ 15 00
Tennessee " "	13 0 @ 14 00
Lake Superior " "	14 75@ 15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$ @$10 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	10 50
Ohio Strong Softener No. 1	10 75
Jackson Co. Silvery No. 1	14 00
Lake Superior Charcoal	14 00
Southern Soft No. 1	10 75
Hanging Rock Charcoal	17 00
ST. LOUIS:	
Southern Coke No 1	$ 9 50@$ 9 75
Southern Coke No. 2	9 00@ 9 25
Southern Coke No. 3	8 50@ 8 75
Southern Gray Forge	8 00@ 8 25
Southern Charcoal No. 1	13 00
Missouri Bessemer	12 00
Ohio Softeners	13 50
Lake Superior Car Wheel	14 50
Southern Car Wheel	14 50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$10 50
Old steel rails (6 ft. and over)	8 50
Old steel rails (6 ft. and under)	7 75
Old car wheels	9 00
	NET TONS
No. 1 R. R. wrought scrap	$ 9 00
Mill scrap	6 50
No. 1 Machine cast scrap	8 00
Iron axles	12 00
Axle turnings	7 00
Wrought turnings (free from cast)	5 50
Cast borings	4 55
Uncut wrought iron boilers	3 20
Steel boiler plates	7 00
Grate bars	5 00
Pipes and flues (clean)	6 50
Tank iron	7 00
Hoop and band iron	5 00
Sheet iron	5 00
Wrought drillings	5 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.10c
Angles	1.10c
Tees	1.20c
Universal Plates	1.10@1.15c
Sheared Plates	1.15c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅜	1.05 Base
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4¼ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6¼ to 6½	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

DIXON'S SILICA GRAPHITE PAINT

FOR TIN OR SHINGLE ROOFS AND IRON WORK. Tin roofs well painted have not required repainting for 10 to 15 years.
IT IS ABSOLUTELY WITHOUT AN EQUAL.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

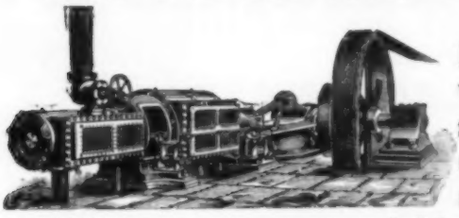
Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

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For Direct Electrical and all High Class Work.

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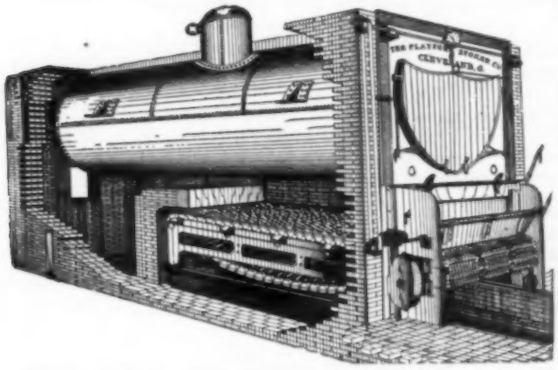
E. F. WILLIAMS.

Park Building, Pittsburg,
SEWARD S. BABBITT.



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Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

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No. 61 Case Library Bldg.,

CLEVELAND, O.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Patented.

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Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6⅝ to 7¼	2.50 ex
¼ to ⅜	.10 "
⅝ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base.
4⅛ to 6 x ⅜ to 1	.10 extra.
6⅛ to 8 x ⅜ to 1	.60 "
8⅛ to 10 x ⅜ to 1	.80 "
1⅛ to 4 x 1 1-16 to 1⅜	.30 "
4⅛ to 6 x 1 1-16 to 1⅜	.40 "
6⅛ to 8 x 1 1-16 to 1⅜	.60 "
8⅛ to 10 x 1 1-16 to 1⅜	.90 "
2 to 4 x 1⅜ to 2	.50 "
4⅛ to 6 x 1⅜ to 2	.60 "
6⅛ to 8 x 1⅜ to 2	.80 "
8⅛ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4⅛ to 6 x 2⅛ to 3	.80 "
6⅛ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¼ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6⅜ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1½ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	30 "
¼ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4½ to 6 x No. 9 to 3-16	.50 "
4½ to 6 x Nos. 10, 11 and 12	.60 "
1½ to 4 x No. 9 to 3-16	.40 "
1½ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No 9 to 3-16	1 30 "
7-16 to ½ x Nos. 10, 11 and 12	1 40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in	.70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅞ to 1⅛	.40 extra.
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
⅛	4 50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes	1 c extra.

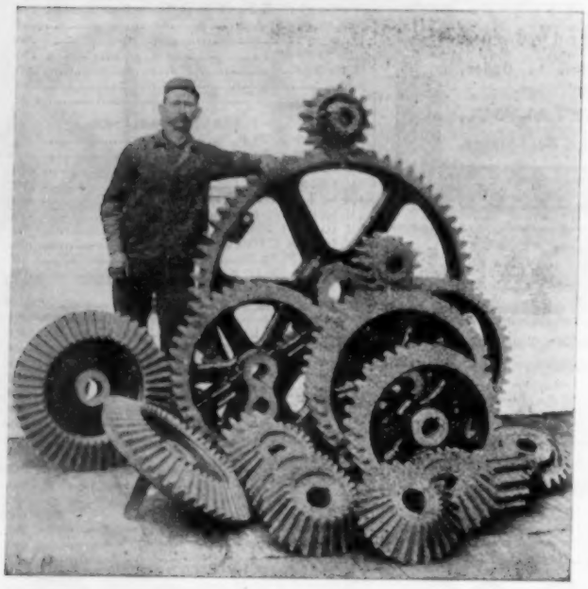
Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.
		Extras.
1⅛ to 6,	" 10, 11, 12 or ⅛"	.05 per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or ⅛"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ⅛"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or ⅛"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or ⅛"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ⅛"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-19	" 10, 11, 12 or ⅛"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ⅛"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1¾,	" 22	.25 "
1 ⅛ to 1⅜,	" 13, 14 and 15	.05 "
1⅛ to 1⅜	" 16, 17 and 18	.10 "



NOISY GEARS AND PINIONS

Indicate imperfect meshing of the teeth, which means hard running and consequent Waste of Power. Perfect fitting Cut teeth save power, lessen fuel bills and soothe the nerves.

We supply gears and pinions having Cut teeth only.

R. D. NUTTALL CO.,

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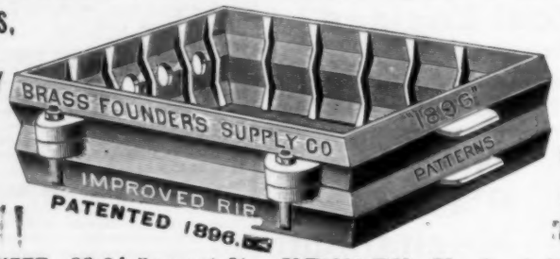
THE BRASS FOUNDERS' SUPPLY CO.

FURNACES, FLASKS, FOUNDRY Supplies and Specialties.



Send for our Catalogue and look at the Ribbed Flask.

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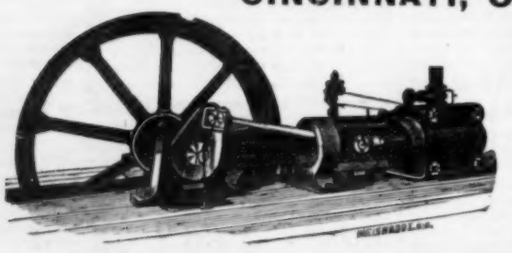
We are the only Steel Roofing Co. awarded Medal and Diploma for PATENT CAP ROOFING at World's Columbian Exposition. We are also large manufacturers of all styles of METAL ROOFING, SIDING, CEILING, ETC. Send for Catalogue and Price List. Mention this paper.

SYKES-IRON & STEEL ROOFING CO., - Chicago and Niles, O.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos.	13, 14 and 15	.20 "
⅞,	"	16, 17 and 18	.25 "
⅞,	"	19 and 20	.30 "
⅞,	"	21	.35 "
⅞,	"	22	.45 "
¾ and 13-16	Nos.	13, 14 and 15	.30 "
¾ and 13-16	"	16, 17 and 18	.35 "
¾ and 13-16	"	19 and 20	.40 "
¾ and 13-16	"	21	.45 "
¾ and 13-16	"	22	.50 "
¾ and 13-16	"	23	.60 "
11-16,	Nos.	13, 14 and 15	.35 "
11-16,	"	16, 17 and 18	.40 "
11-16,	"	19 and 20	.50 "
11-16,	"	21	.60 "
11-16,	"	22	.70 "
11-16,	"	23	.80 "
⅝,	Nos.	13, 14 and 15	.40 "
⅝,	"	16, 17 and 18	.45 "
⅝,	"	19 and 20	.55 "
⅝,	"	21	.65 "
⅝,	"	22	.75 "
⅝,	"	23	.85 "
9-16,	"	13, 14 and 15	.45 "
9-16,	"	16, 17 and 18	.50 "
9-16,	"	19 and 20	.60 "
9-16,	"	21	.70 "
9-16,	"	22	.80 "
9-16,	"	23	.90 "
½,	"	13, 14 and 15	.55 "
½,	"	16, 17 and 18	.60 "
½,	"	19 and 20	.70 "
½,	"	21	.80 "
½,	"	22	.90 "
½,	"	23	1.00 "
7-16,	"	13, 14 and 15	.80 "
7-16,	"	16, 17 and 18	.90 "
7-16,	"	19 and 20	1.00 "
⅜,	"	13, 14 and 15	1.00 "
⅜,	"	16, 17 and 18	1.10 "
⅜,	"	19 and 20	1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

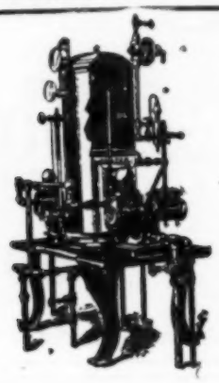
The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.



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BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

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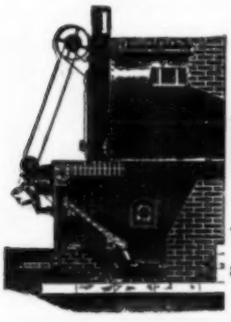
26 CORTLANDT STREET, NEW YORK.

H. H. CAMPBELL.



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648 Broadway, CLEVELAND, O.

SOLE MANUFACTURERS OF THE

Brightman Mechanical Stoker

FOR STEAM BOILERS.

THE MOST ECONOMICAL IN FUEL

and the Best Device in the World for Preventing Smoke.

Send for Catalogue "A"

STUART FIRE BRICK CO.

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Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats. cts. lbs.

2 to 9-16 in. wide by 2 to ⅝ thick .08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON. cts lbs.

1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08
7-16 to ¾ and 2⅜ to 3 in	09
3⅛ to 4 in	09½
⅜ to 11-16 and 4⅛	10
⅛ to 6 in	10½
¼ to 9-32 and 6⅛ to 7 in	11
1 in	13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s			.62
Butt " " " four 10s			.62½
Lap " galv. " four 10s			.52½
Butt " " " four 10s			.50
Boiler tubes 2¼" and smaller			.70
Boiler tubes 2½" and larger			.75
Casting screw and socket joint			dis. 52½
Casing inserted joint			dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 5 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.,	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper&Straight Shank to 1½"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150 gr.	Flour, C. F. F.
Kegs, ₩ lb	4½c	3 c	2½c
½ kegs ₩ lb	4¾c	3¼c	2¾c
¼ kegs ₩ lb	5 c	3½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3½	3⅛
Hexagon	15⅝	11⅝	8½	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ₩ keg, base.
Car lots.....$1.35
Less than car lots.....$1.45

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 50
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75&5
" " Nos. 27@36.....dis 75@10&5
Coppered Nos. 0 to 18, market list.....dis 70@70&5
Galvanized Nos. 0 to 18 " " .....dis65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ₩ lb dis 30

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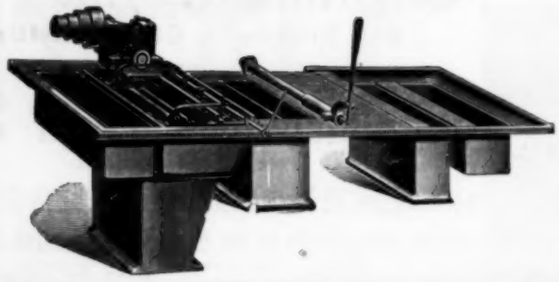

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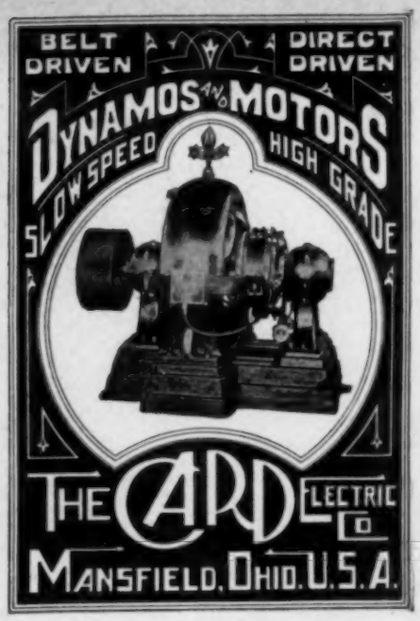

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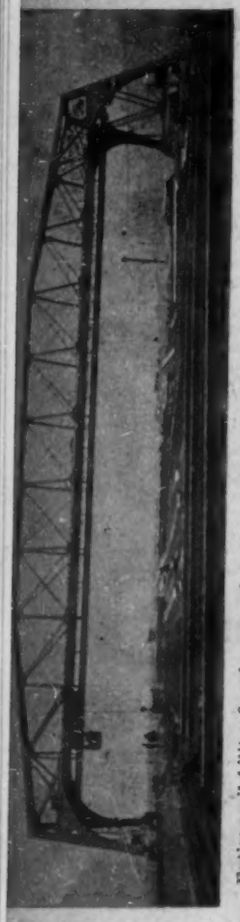

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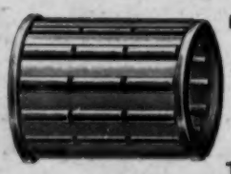

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